MYCOLOGIA

IN CONTINUATION OF THE JOURNAL OF MYCOLOGY

Founded by W. A. Kellerman, J. B. Ellis, and B. M. Everhart in 1885

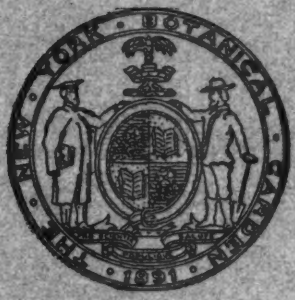
OF DETROIT

EDITOR

WILLIAM ALPHONSO MURRILL

Vol. III—MARCH, 1911—No. 2

APR 20 1911



ASSOCIATE EDITORS

JOSEPH C. ARTHUR
HOWARD J. BANKER
GIACOMO BRESADOLA
FREDERIC E. CLEMENTS
JOHN DEARNESS
FRANKLIN S. EARLE
BRUCE FINK
THOMAS H. MACBRIDE
PAUL MAGNUS
GEORGE MASSEE
NARCISSE PATOUILLARD
LARS ROMELL
FRED J. SEAVER
CORNELIUS L. SHEAR

PUBLISHED BIMONTHLY FOR
THE NEW YORK BOTANICAL GARDEN
By THE NEW ERA PRINTING COMPANY
LANCASTER, PA.

CONTENTS

PAGE

Studies in North American Hyphomycetes—I.
DAVID ROSS SUMSTINE 45

Studies in Colorado Fungi—I. Discomycetes
FRED J. SEAVER 57

Cultures of Some Heteroecious Rusts. W. P. FRASER . 67

The Personal Factor in Mushroom Poisoning
JOHN DEARNESS 75

The Agaricaceae of Tropical North America—II.
WILLIAM A. MURRILL 79

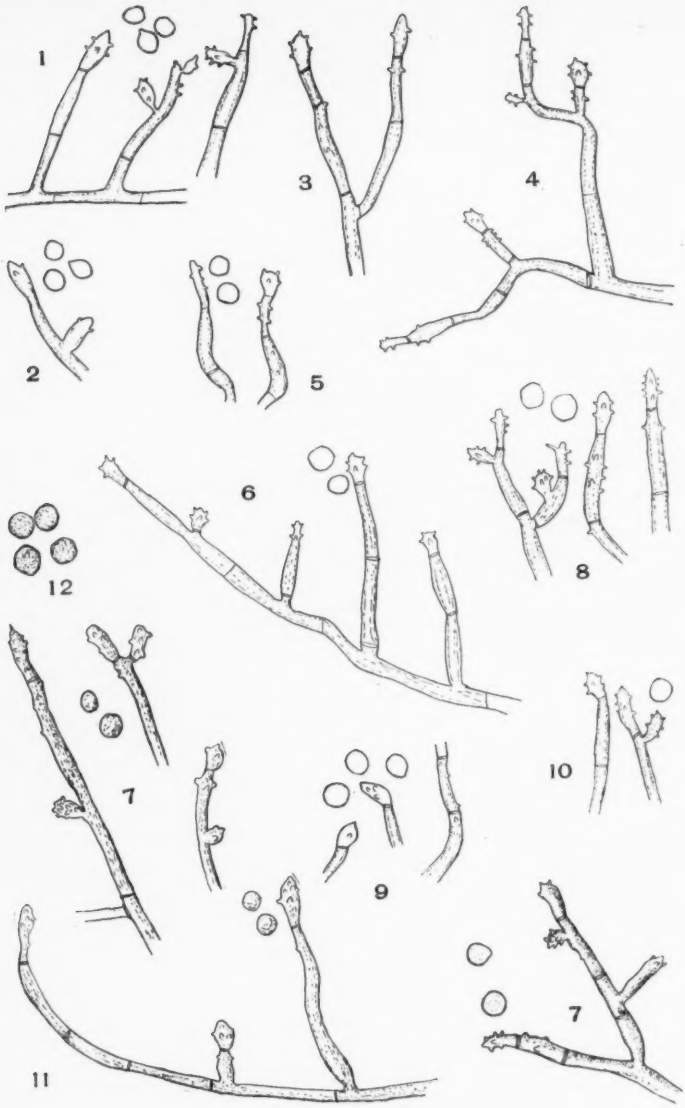
News and Notes 92

The New Era Printing Company makes the following charges to authors for articles reprinted from MYCOLOGIA, if ordered with proof:

Without Cover—	4 pp.	8 pp.	12 pp.	16 pp.	20 pp.	24 pp.	28 pp.	32 pp.
25-50 Copies—	$1.37	$1.87	$2.12	$2.50	$3.50	$4.05	$4.82	$5 20
100 "	1.55	2.15	2.65	3.15	4.05	5.00	6.10	6.50
200 "	2.00	3.05	4.00	4.30	5.60	6.90	8.30	8.90

Covers—First 50—$1.00. Additional, 1c each.

Plates—40c per 100.



RHINOTRICHUM

MYCOLOGIA

VOL. III MARCH, 1911 NO. 2

STUDIES IN NORTH AMERICAN HYPHOMYCETES—I

THE GENERA RHINOTRICHUM AND OLPITRICHUM

DAVID ROSS SUMSTINE

(WITH PLATES 37–39, CONTAINING 40 FIGURES)

This group of fungi is a heterogeneous mass of unrelated genera and species and seems to have been rather studiously avoided by American mycologists. The literature on the North American species is exceedingly rare. Several genera of leaf parasites have been studied but otherwise little has been done in the group. Pound and Clements* have re-arranged the whole group with reference to the North American species.

Many species are known to be the conidial stages of ascomycetes and should be excluded from the group. The following genera contain species that have been definitely associated with other fungi, *Oidium, Polythrincium, Verticillium, Diplocladium, Dactylium, Mycogone,, Acrostalagmus, Sepedonium, Isaria, Hadrotrichum, Oedocephalum.*

Some genera are autonomous but a study of their structure and their fructification shows that their affinity is with other groups. Among such genera are the following: *Microstroma, Myxotrichum, Aspergillus, Penicillium, Zygodesmus.*

With our limited knowledge of this perplexing group it is better to defer the arrangement of it until a more exhaustive study of the genera and species has been made.

* Minn. Bot. Studies **9**: 644–673. 1896. Ibid. 726–738. 1897.

[MYCOLOGIA for January, 1911 (3: 1–44), was issued January 31, 1911]

My thanks are due to Dr. N. L. Britton, of the New York Botanical Garden, for permission to examine the collection in the herbarium, and to Mr. Sydney Prentice, of Pittsburgh, for assistance in making the drawings. The kind assistance of other persons is acknowledged in the proper place under the discussion of different species.

RHINOTRICHUM Corda, Ic. Fung. 1: 17. 1837

Physospora Fries, Summa Veg. Scand. 495. 1849.

Type species, *Sporotrichum rubiginosum* Fries.

ORIGINAL DESCRIPTION: Flocci erecti, septati, supra verrucosi; sporis simplicibus verrucis innatis, dein deciduis et hylo instructis. Fries describes the genus *Physospora* as follows: Flocci caespitosi, septati, persistentes, demum laxi, sporis vesiculosis, simplicibus, e floccorum verrucis enatis adspersi.

Type species, *Rhinotrichum simplex* Corda.

Saprophytic or parasitic(?); mycelium creeping, septate, intricately interwoven, forming a loose or sometimes rather dense stratum; fertile branches erect or suberect, simple or branched; spores simple, colorless or slightly colored, borne on spicules (sterigmata) on the ultimate divisions (basidia) of the fertile branches.

Rhinotrichum canescens Speg., parasitic on leaves, has been reported from Paraguay. If this is a true *Rhinotrichum* it is the only parasitic species known. All other known species grow on decaying wood or stems, usually on the under side.

The genus *Physospora* is not necessary, as the species under it may well be included under the genus *Rhinotrichum* as defined above. The difference lies chiefly in the swollen divisions of the fertile branches of the former. But all branches are not swollen, some are attenuated as in some species of *Rhinotrichum*.

Either *Physospora* must be reduced to synonymy or else the species *R. Curtisii* and *R. ramosissimum* must be transferred to *Physospora*. The differences in this case are not sufficient to justify two distinct genera.

The genera *Rhinotrichum* and *Botrytis* are somewhat related. In the latter the spores are clustered at the tips of the fertile branches, while in the former the spores are more or less scattered on the ultimate division or divisions of the fertile branches.

The genus *Sporotrichum* is also closely allied to *Rhinotrichum*, the chief difference being the procumbent fertile branches of the former. It is possible that a study of the described species of *Sporotrichum* will add a number of species to *Rhinotrichum*.

KEY TO THE SPECIES

Spores globose or nearly so.	
Spores smooth.	
Stratum reddish-brown.	1. *R. rubiginosum.*
Stratum yellow-rust color.	2. *R. subferruginosum.*
Stratum yellow to brown.	
Spores large, 15–16 μ.	3. *R. fulvum.*
Spores smaller.	
Stratum yellow.	4. *R. Curtisii.*
Stratum yellow-brown.	5. *R. laevisporum.*
Spores not smooth.	
Spores granular.	6. *R. armeniacum.*
Spores roughened, 5 μ.	7. *R. carneum.*
Spores roughened, 8–10 μ.	8. *R. subalutaceum.*
Spores not globose.	
Stratum white to cinereous.	9. *R. repens.*
Stratum sulphur-colored.	10. *R. sulfureum.*
Stratum light-brown.	11. *R. bicolor.*
Stratum light-yellow.	12. *R. tenerum.*
Stratum tan-yellow.	13. *R. ramosissimum.*

1. **Rhinotrichum rubiginosum** (Fr.)

Sporotrichum rubiginosum Fries, Syst. Myc. 3: 417. 1829.
Physospora rubiginosa Fries, Summa Veg. Scand. 495. 1849.

Stratum very thin, cespitose, reddish-brown, rubiginose; hyphae septate, branching, 6–8 μ thick; fertile branches erect, simple or branched, ultimate divisions usually swollen, sometimes attenuate, bearing the smooth, concolorous, globose-obovoid, 11–15 μ spores.

On bark and wood.

SPECIMENS EXAMINED: Canada, *Ellis Collection 1623;* New York, *Peck.*

2. **Rhinotrichum subferruginosum** sp. nov.

Stratum thin, floccose, bright yellow-rust color, ferruginous; hyphae branched, septate, 8–10 μ thick; fertile branches erect or suberect, branched, attenuated upwards or ultimate divisions swollen; spores borne on several divisions of the fertile branches, smooth, globose, colored, 14 μ.

On bark, woodpile, Hope, Jamaica, October 25, 1902.

SPECIMENS EXAMINED: Jamaica, *Earle 93* (type).

The type specimen is at the New York Botanical Garden.

3. RHINOTRICHUM FULVUM Berk. & Curt. Grevillea 3: 108. 1874

Stratum thin, fulvous; hyphae septate; fertile branches septate, ultimate divisions elongate, with spicules; spores subglobose, granular, 15–16 μ.

SPECIMENS EXAMINED: South Carolina, *Ravenel* (type, spores only).

The description is compiled largely from the original, as the material at hand was too meager for proper study. It seems very near *R. Curtisii*. *Rhinotrichum Thwaitesii* var. *fulvum* Grove is reported from England. It has verrucose spores, 7–10 μ.

4. RHINOTRICHUM CURTISII Berk. Grevillea 3: 108. 1875

Rhinotrichum Sumstinei Peck, Bull. Torrey Club 34: 103. 1907.

Stratum effused, thick, golden-yellow, brownish in older specimens; hyphae branched, septate, 8–12 μ thick; fertile branches erect, branched, septate, ultimate divisions usually swollen, covered with spicules; spores globose or subglobose, smooth, variable in size, 12–16 μ.

On decayed wood.

SPECIMENS EXAMINED: New York, *Peck;* Pennsylvania, *Sumstine;* Ohio, *Kellerman;* South Carolina (type).

In the original description, *Aspergillus laneus* Schw. is given as a synonym. The specimen in the Academy of Sciences, Philadelphia, marked *Aspergillus laneus* is too scanty for proper identification and therefore the real relationship between these two species could not be definitely determined.

Rhinotrichum Sumstinei does not seem to be specifically different. The size and the shape of the spores agree with *R. Curtisii*. The color is given as "tawny-brown." The type at Albany and the cotype in the Carnegie Museum, Pittsburgh, were examined.

The color of this species as well as of other species depends very much upon the exposure to the sunlight. When exposed to strong sunlight the color becomes darker, even brown. In a shady or secluded place the lighter shades of yellow predominate.

5. **Rhinotrichum laevisporum** (Cooke)

Zygodesmus laevisporus Cooke, Grevillea **6**: 139. 1878.

Stratum thin, effused, ochraceous yellow-brown; hyphae sparingly branched, septate, 6–8 μ thick; fertile branches erect, septate, apex swollen with few spicules, frequently the ultimate and penultimate divisions with spicules; spores globose, smooth, 10–14 μ.

On decayed wood.

SPECIMENS EXAMINED: Louisiana, *Ravenel 58.*

This species is near *R. Curtisii.* The few spicules chiefly distinguish it from that species.

6. RHINOTRICHUM ARMENIACUM Berk. & Curt. Grevillea **3**: 108. 1875

Stratum thin, yellow to yellow-brown; hyphae branched, spinulose, occasionally portions smooth, septate, 6–8 μ thick; fertile branches spinulose, attenuate upwards, septate (?); spores globose, colored, granular, 14–15 μ.

On decayed wood.

SPECIMENS EXAMINED: South Carolina, *3011* (type).

The authors characterize it as, "Forming a thin apricot-colored stratum; flocci ascending, articulated, the ultimate joints much elongated, granulated; spores globose."

The color apparently is yellow or yellowish-brown. The spinulose hyphae and larger spores separate it from *R. subalutaceum.*

7. RHINOTRICHUM CARNEUM Ellis & Ev. Jour. Myc. **1**: 93. 1885

Stratum loose, floccose, dull-white at first, then flesh-colored; hyphae 6–8 μ thick; fertile branches obtusely rounded at the apex, with minute spicules, septate; spores globose, delicately spinulose, 5 μ.

On decayed wood.

SPECIMENS EXAMINED: Canada, *Macoun;* Oregon, *Carpenter 125* (type).

A study of better material may place this species in some other genus.

8. RHINOTRICHUM SUBALUTACEUM Peck, Ann. Rep. N. Y. State Mus. **34**: 51. 1881

Stratum thin, effused, yellow-brown, alutaceous, paler on the margin; hyphae branched, intricately interwoven, smooth, septate, 8–12 μ thick; fertile branches generally short, sometimes elongate, non-septate, usually abruptly narrowed at the apex, which bears the minute spicules; spores concolorous or lighter, globose, under high power of the microscope slightly roughened or echinulate, 8–10 μ.

On decayed wood.

SPECIMENS EXAMINED: Iowa, *Holway 295;* New York, *Peck* (type).

The type was collected in the Helderberg Mountains, N. Y. The species is readily distinguished by the short fertile branches.

9. RHINOTRICHUM REPENS Preuss; Sturm, Deutsch. Fl. **6**: 43. 1862

Stratum thin, effused, white to cinereous; hyphae creeping, septate, branched, 6–8 μ thick; fertile branches erect, septate, simple, equal or slightly attenuate upwards; spores ovoid-ellipsoid, smooth, 12–16 μ, occasionally with nucleus or with granular appearance.

On decayed wood.

SPECIMENS EXAMINED: Massachusetts, *Farlow* (in the herbarium of Dr. Fairman 1086).

10. RHINOTRICHUM SULFUREUM Ellis & Ev. Bull Torrey Club **11**: 18. 1884

Stratum effused, thin, pale sulfur-colored, nearly white at first; hyphae branched, septate, 7–8 μ thick; fertile branches erect, simple, septate, some gradually attenuate above, others equal or somewhat enlarged, several divisions bearing spicules; spores obovoid-ellipsoid, granular, 9–10 $\times$ 11–15 μ.

On decayed wood.

SPECIMENS EXAMINED: Iowa, *Holway 296* (possibly part of the type); New Jersey, *Ellis 1662;* New York, *Fairman 1088.*

The New Jersey specimen is very thin, brownish-yellow, spores 11 $\times$ 16 μ. The color may be due to age.

11. **Rhinotrichum bicolor** sp. nov.

Stratum effused, thin, light-brown to alutaceous, dirty-white on the margin; hyphae branched, septate, hyaline or slightly col-

ored, 6–8 μ thick; fertile branches long, simple, erect, attenuate upwards, the ultimate divisions spiculiferous; spores obovoid-ellipsoid, smooth, colored, 8–10 by 10–16 μ.

On decayed wood.

SPECIMENS EXAMINED: New York, *O. F. Cook 244;* Pennsylvania, *Sumstine* (type), *Ellis & Harkness 3331.*

The margin is white or dirty-white, the brown color appearing near the center. Part of the original collection is deposited at the New York Botanical Garden. The type is in the Carnegie Museum, Pittsburgh.

12. **Rhinotrichum tenerum** sp. nov.

Stratum effused, thin, sometimes collected in rather thick patches, light-yellow, almost white on the margin; hyphae septate, branched, with numerous H-shaped formations, 5–6 μ thick; fertile branches erect, septate, attenuate upwards, the last few divisions bearing the prominent spicules; spores globose-ellipsoid, hyaline or nearly so, smooth with granular contents, 8–11 × 10–15 μ.

On decayed wood.

SPECIMENS EXAMINED: Louisiana, *Langlois 2479.*

The specimens are in the Ellis collection in the New York Botanical Garden and are labeled *Rhinotrichum tenerum* E. & E. n. sp. I was unable to find any published description of this species and have presumed that the name has not been published. The following descriptive note is found on the label: "Hyphae hyaline, septate, branched, evanescent, 5–6 μ thick, the terminal segments spiculiferous and bearing the globose, subelliptical, yellowish, hyaline, 8–10 μ, smooth conidia with granular contents."

13. RHINOTRICHUM RAMOSISSIMUM Berk. & Curt. Grevillea 3: 108. 1875

Stratum effused, thick or sometimes thin, yellow, alutaceous, tan-colored hyphae branched, septate, 8–10 μ thick; fertile branches erect, branched, septate, ultimate divisions elongate or swollen, covered with spicules; spores obovoid, frequently apiculate, smooth, variable in size, 8–12 × 13–16 μ.

On decayed wood.

SPECIMENS EXAMINED: New Jersey, *Ellis;* New York, *Peck;* Pennsylvania, *Sumstine;* South Carolina (type).

In the collection at Albany, Peck marked a specimen var. *marginatum*. It has a light-yellow margin, but otherwise agrees with the type.

This species is exceedingly variable in color and in size of spores, although the shape of the spores is rather uniform. The species is, no doubt, cosmopolitan.

DOUBTFUL SPECIES

1. *Rhinotrichum herbicolum* Ellis and Dearness, Proc. Canadian Inst. **1**: 90. 1897. "Effused, light yellow, becoming brown in the centre. Hyphae, coarse, septate, branched, nearly hyaline, 8–10 μ thick. Fertile hyphae, sub-undulate above, tips swollen and bearing the globose, sub-hyaline, finely echinulate, 7–9 μ conidia.

"On dead stems of *Solidago canadensis*, London, Can., Aug., 1895."

The species is said to differ from *R. Curtisii* in its coarser hyphae and in its smaller echinulate conidia. The specimen in the Ellis collection in the New York Botanical Garden, which is probably a part of the type collection, shows the spores clustered at the apex of the fertile branches. Better material is necessary before its proper place can be determined. It resembles in many respects *Botrytis fulva* Link.

2. *Rhinotrichum bellum* Berk. & Curt. Grevillea **3**: 108. 1875. "Vivide aurantiacum, effusum; sporis oblongo-ellipticis.

"Dead wood, Ala. Beaumont 4865."

No specimen of this species was examined by me and so far as known it has not been found since its first discovery.

3. *Rhinotrichum pulveraceum* Ellis; Kellerman, Jour. Myc. **1**: 47. 1885. "Forming a thin pale, yellowish white, subgranulose layer on the matrix; hyphae much branched, the ends swollen and smooth; the conidia (appearing at first inside these swollen ends and pushing out through the investing membrane?) variable in size and shape, globose, 5–9 μ in diameter or elliptical, 5–12 $\times$ 5–7 μ. The elliptical conidia mostly with a slight apiculus at one end. The branching hyphae are sparingly septate and mostly not over 3 μ in diameter.

"Peculiar in the smooth swollen tips. The sterile hyphae form

a thin, white, soft layer like a Corticium on the surface of the wood.

"On dead wood and bark. Topeka, Kansas."

The type is not accessible and the description not clear enough for exact determination.

EXCLUDED SPECIES

1. *Rhinotrichum fusiferum* Berk. & Curt. Grevillea **3**: 108. 1875. The original description is exceedingly short and might apply to a number of fungi.

"Dull yellow, flocci short, inarticulate, studded above with the fusiform spores, .0016′–0015′ long.

"A very pretty species. Car. Inf. 4964."

The part of the type specimen sent from Berkeley's herbarium was too meager for identification. A number of fusiform spores 5–36 μ were found in the material. The spores seemed granular or even warted and some seemed to be septate. Too little is known about this species to assign it definitely to any genus.

2. *Rhinotrichum breve* Berk. & Curt. Grevillea **3**: 109. 1875. The label also bears the name *Aspergillus affinis*. The spores in the type specimen agree very well with the description but the attachment of the spores could not be satisfactorily determined. It evidently does not belong to the genus *Rhinotrichum*. The specimen was collected in South Carolina.

3. *Rhinotrichum doliolum* Pound and Clements, Bot. Sur. Neb. **4**: 5. 1896.

"Effused, white, compact, velvety, gray, or drab; sporophore ascending much branched; filaments hyaline, tortuous, many septate, 5 μ wide, thickly beset with bottle-shaped basidia, 7–8 $\times$ 3–4 μ, generally opposite, rarely alternate; conidia 2–several on each basidium, borne on short sterigmata, hyaline, ovoid-ellipsoid 3–5 $\times$ 2–3 μ.

"Forming a thick crust on the sporangia and stipes of a slime mould, bluffs of the Missouri river, Bellevue (4381)."

This species evidently does not belong to *Rhinotrichum* as defined in this paper. The basidia(?) with 2–several spores point to the genus *Olpitrichum*. The type specimen has been lost or destroyed.

My thanks are due to Dr. Clements, of the University of Minnesota, and Dr. Bessey, of the University of Nebraska, for information concerning this species.

4. *Physospora elegans* Morg. Jour. Cinc. Soc. Nat. Hist. **17**: 44. 1875. Not *Physospora elegans* Cav. "Effused thin, flocculose, then pulverulent, bright ochraceous; hyphae long, slender, creeping, septate, dilute ochraceous, much branched and interwoven, producing everywhere short erect inflated vesicles. These vesicles ellipsoid, obovoid, or quite irregular, 14–20 × 9–12 mic. bearing at the apex usually two (1–3) spores on short blunt pedicels; spores globose, ochraceous 16–20 mic. in diameter.

"Growing on rotten oak trunks. Preston, Ohio."

The type specimen is no longer in existence but through the kindness of Dr. Macbride, of the University of Iowa, the original drawing made by Mrs. Morgan was sent to me for examination. The species is remarkable for the many clamp connections in the hyphae. It is closely allied to the genus *Zygodesmus*. Possibly it would be better to establish a new genus for this species.

5. *Rhinotrichum muricatum* Ellis and Ev. Proc. Acad. Phila. 86. 1891. The specimen in the New York Botanical Garden labeled with this name is very clearly not a *Rhinotrichum*.

6. *Rhinotrichum corticioides* Cooke, Grevillea **13**: 27. 1883. The specimen was collected in South Carolina by Ravenel. It belongs to the Thelophoraceae, probably *Hymenochaete Ellisii* Berk. and Cooke. Part of the type was examined.

7. *Rhinotrichum macrosporum* Farlow. See under the genus *Olpitrichum*.

8. *Rhinotrichum tenellum* Berk. & Curt. See in a later paper under the genus *Gonatobotrys*.

9. *Rhinotrichum cucumerinum* Berk. & Curt. See in a later paper under the genus *Gonatobotrys*.

OLPITRICHUM Atkinson, Bot. Gaz. **19**: 244. 1894

Saprophytic; mycelium septate, branched, interwoven; fertile branches erect, simple or branched, septate, ultimate divisions with flask-shaped fusoid or irregular processes (sterigmata) at the top bearing the simple, hyaline or pale-colored spores.

Type species, *Olpitrichum carpophilum* Atkinson.

This genus bears some resemblance to *Rhinotrichum* as the author states: "It is *Rhinotrichum* but with inflated basidia which are constricted at the point of union with the hyphae." In the original description the irregular spore-bearing processes are called basidia but to me the term sterigmata seems more appropriate.

KEY TO THE SPECIES

Spores very irregular.	1. *O. carpophilum.*
Spores regular or nearly so.	2. *O. macrosporum.*

1. OLPITRICHUM CARPOPHILUM Atkinson, l. c.

Stratum thin, white, or slightly colored; hyphae branched, septate, creeping, 5–8 μ thick; fertile branches erect, simple or branched, septate, bearing at the apex flask-shaped, fusoid, or enlarged processes (sterigmata) irregularly scattered or gregarious; spores ovoid-oblong, hyaline or pale-colored, irregular, 13–16 $\times$ 18–30 μ.

On *Gossypium herbaceum.*

SPECIMENS EXAMINED: Alabama, *Atkinson* (type).

The spores are exceedingly variable in shape and size. Very irregular bodies are developed on some of the fertile branches. The real nature of these bodies is not known. A careful examination did not reveal anything that resembled sterigmata.

I am indebted to Professor Atkinson, of Cornell University, for a slide of the type material.

2. **Olpitrichum macrosporum** (Farlow)

Rhinotrichum macrosporum Farlow; Sacc. Michelia **2**: 148. 1880.

Stratum effused or pulvinate, sordid-white; hyphae branched, septate, 8 μ thick; fertile branches erect, remotely septate, slightly colored, bearing near the apex irregular or sometimes branched processes (sterigmata); spores ovoid or obovoid, smooth, hyaline or slightly colored, 16 $\times$ 30–35 μ.

SPECIMENS EXAMINED: Louisiana, *Ellis Collection 1653.*

The specimens in the Ellis collection were evidently communicated by Dr. Farlow and in all probability are part of the original collection.

The principal difference between the two species is in the form of the spores. When more and better material is studied these two species may prove to be the same.

HIGH SCHOOL,
PITTSBURGH, PA.

EXPLANATION OF PLATE 37 (frontispiece)

All the figures on this and the following plates were drawn with the aid of the camera lucida and are highly magnified. The drawings show the fertile branches and the spores unless otherwise indicated.

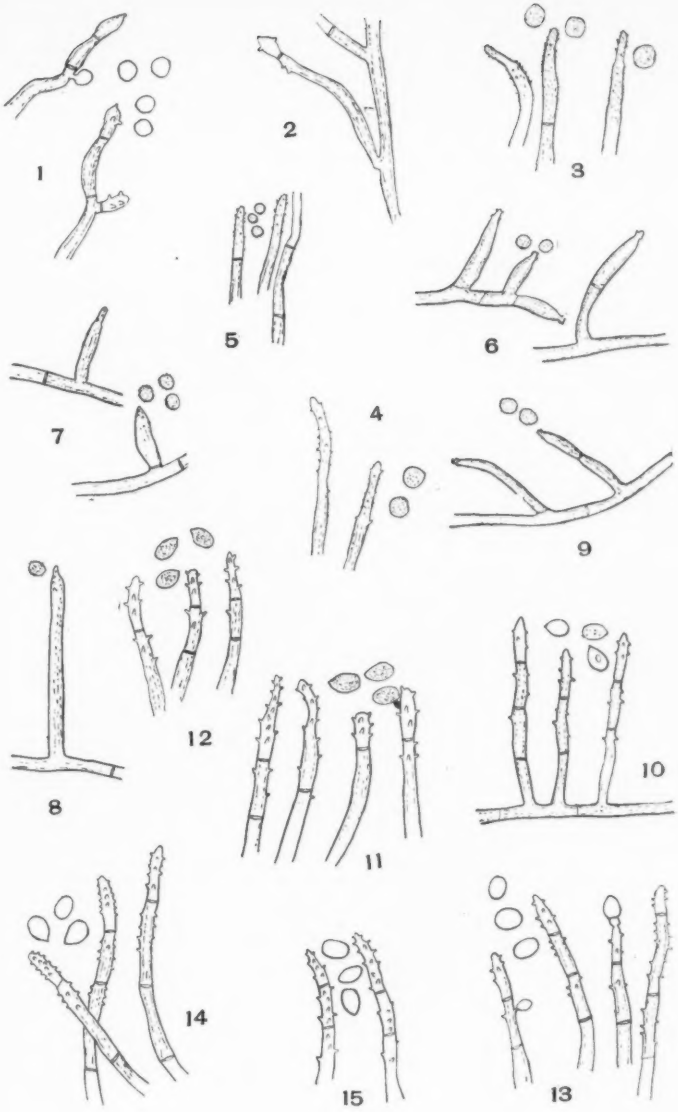
1–2. *Rhinotrichum rubiginosum* (Fr.) Sumstine.
3–5. *Rhinotrichum subferruginosum* Sumstine. From type.
6–11. *Rhinotrichum Curtisii* Berk. 9 and 10, from type material; 7, from type of *R. Sumstinei* Peck.
12. *Rhinotrichum fulvum* Berk. & Curt. From type material. Spores only.

EXPLANATION OF PLATE 38

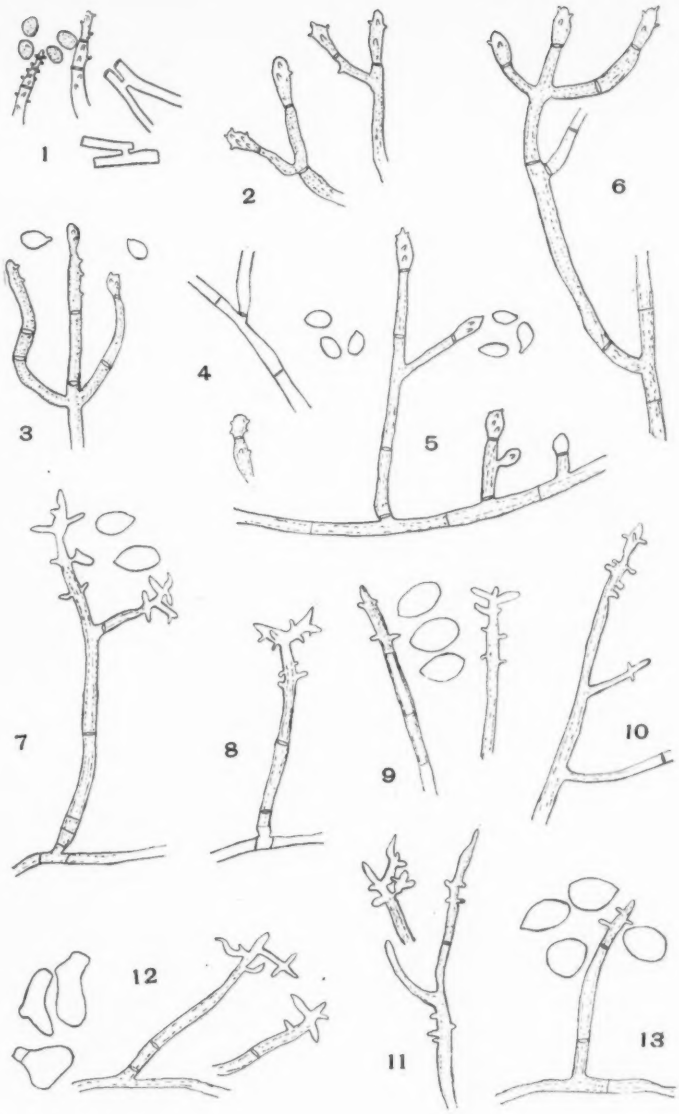
1–2. *Rhinotrichum laevisporum* (Cooke) Sumstine.
3–4. *Rhinotrichum armeniacum* Berk. & Curt. From type material.
5. *Rhinotrichum carneum* Ellis & Ev. From type material.
6–9. *Rhinotrichum subalutaceum* Peck. From type material.
10. *Rhinotrichum repens* Preuss.
11–12. *Rhinotrichum sulfureum* Ellis. & Ev. 11, possibly from part of type.
13–15. *Rhinotrichum bicolor* Sumstine. From type.

EXPLANATION OF PLATE 39

1. *Rhinotrichum tenerum* Ellis & Ev. Type.
2–6. *Rhinotrichum ramosissimum* Berk. & Curt. 4, from type material.
7–11. *Olpitrichum macrosporum* (Farlow) Sumstine.
12–13. *Olpitrichum carpophilum* Atkinson. From type material.



RHINOTRICHUM



RHINOTRICHUM AND OLPITRICHUM

STUDIES IN COLORADO FUNGI—I. DISCOMYCETES

FRED J. SEAVER

The present report is based on a collection of fungi made by the writer and Professor Elsworth Bethel, during a part of last August and September, in the Rocky Mountains in the vicinity of Denver. The most of the collections were made about Tolland, on the Moffat Road, at an elevation of 9,000 to 10,000 feet, at Golden, in the foothills, at an elevation of 6,000 feet, and in Geneva Creek Canyon, at elevations of 8,000 to nearly 14,000 feet.

Of a collection of 900 specimens, about 250 were included in the discomycetes. A critical study of these has revealed a number of points of interest, and, for this reason, a list of the species determined is reported in the following paper, with comments on those which are of especial interest. A number of species collected I have been unable to determine, and these are held for more critical study. Specimens of the species reported here are deposited in the herbarium of the Garden.

GEOGLOSSACEAE

MITRULA GRACILIS Karst. Hedwigia **22**: 17. 1883

Dr. E. J. Durand in his recent monograph of the North American Geoglossaceae (Ann. Myc. **6**: 26. 1908) records this species from Labrador and Newfoundland; he also states that the species has been reported from Greenland. Our Colorado specimens agree well in spore characters and habitat with the description given by Dr. Durand. The plants occur attached to and apparently parasitic on some species of bog moss in one of the gulches of Geneva Creek Canyon, where they were collected in quantity. *Mitrula musicola* P. Henn., which has been reported from Alberta, is said to differ only in the larger size and more convolute hymenium. More than a hundred plants were collected in Colorado and on the same host the fungus was found to vary much in size; young plants were found with a stem not over 2 mm. long

and a pileus 1 mm. in diameter, while in older plants the stem was often 2 cm. long and the pileus as large as 4 mm. in diameter, the convolutions being more marked in old than in young plants. To me it would seem doubtful if these two species can be separated on these characters. A single specimen of *Mitrula musicola* was found in the Garden collection.

MITRULA IRREGULARIS (Peck) Durand, Ann. Myc. **6**: 398. 1908

Several specimens of this species were collected at Tolland, where the plants occur on bare ground or among moss in coniferous woods. The species has formerly been reported from Ontario and New Brunswick south to the District of Columbia.

HELVELLACEAE

HELVELLA ELASTICA Bull. Hist. Champ. Fr. 299. 1791

Two plants collected among moss in Geneva Creek Canyon.

RHIZINACEAE

PSILOPEZIA BABINGTONI Berk. Outl. Brit. Fungol. 373. 1860

On rotten wood in Geneva Creek Canyon.

PEZIZACEAE

BARLAEA CONSTELLATIO (Berk. & Br.) Sacc. Syll. Fung. **8**: 111. 1889

This species was found to be very common on damp soil, both at Tolland and in Geneva Creek Canyon. The plants are bright-red and the spores smooth, with one large oil-drop often surrounded by numerous smaller ones.

BARLAEA CREC'HQUERAULTII (Crouan) Sacc. Syll. Fung. **8**: 113. 1889

Ascobolus Crec'hqueraultii Crouan, Ann. Sci. Nat. IV. **10**: 194. 1858.

Peziza modesta Karst. Myc. Fenn. **1**: 64. 1871.

Crouania asperella Rehm, Hedwigia **24**: 226. 1885.

This species was collected in Pennsylvania in 1881 and distributed by Mr. Ellis in North American Fungi *841* under the name of *Peziza modesta* Karst., which species is undoubtedly a synonym of the above. The species has also been collected and reported by the writer from Iowa. Several collections of this species

were made in Colorado, at Tolland and in Geneva Creek Canyon. The plants collected in Colorado are as large as 5 mm. in diameter, a little larger than the Iowa specimens, but spore characters are identical. Cotype material of *Crouania asperella* Rehm has been examined and found to be the same. While the species has been commonly collected and distributed in European exsiccati, the only American specimens seen, with the exception of our own collections, were those distributed by Mr. Ellis in his exsiccati. *Peziza modesta* Karst. has also been reported from Minnesota by Miss D. Hone. For diagnostic characters and illustration, see Iowa Discomycetes.

DETONIA TRACHYCARPA (Curr.) Sacc. Syll. Fung. **8**: 105. 1889

This specimen was mailed to me after returning from Colorado, having been collected by Professor E. Bethel at Lake Eldora, Sept. 17, 1910.

HUMARIA ORTHOTRICHA (Cooke & Ellis) Sacc. Syll. Fung. **8**: 119. 1889

On the ground among moss, Geneva Creek Canyon.

HUMARIA RUBENS Boud. Bull. Soc. Myc. Fr. **12**: 13. 1896

One collection in Geneva Creek Canyon.

LACHNEA MINIATA Funckel, Symb. Myc. app. **3**: 32. 1875

The species is characterized by its reticulate spores. Two collections were made in Geneva Creek Canyon.

LACHNEA SETOSA (Nees) Gill. Discom. 75. 1879

One collection on wood at Golden.

LACHNEA UMBRORUM (Fries) Sacc. Syll. Fung. **8**: 174. 1889

Abundant on soil at Tolland and in Geneva Creek Canyon. Similar in general appearance to *L. scutellata* but spores very rough, verrucose.

OTIDEA LEPORINA (Batsch) Fuckel, Symb. Myc. 229. 1869

One collection at Tolland.

PEZIZA CUPULARIS L. Sp. Pl. ed. 2. 1651. 1763

Common on the ground in coniferous woods at Tolland and in Geneva Creek Canyon.

PEZIZA BADIA Pers. Obs. Myc. **2**: 78. 1799

On soil and rotten wood in Geneva Creek Canyon.

PEZIZA BRUNNEO-ATRA Desm. Ann. Sci. Nat. II. **6**: 244. 1836

On soil in Geneva Creek Canyon.

SARCOSPHAERA ARENOSA (Fuckel) Lindau in E. & P. Nat. Pfl. **1**[1]: 182. 1897

Two collections on sandy soil in Geneva Creek Canyon.

SPHAEROSPORA TRECHISPORA (Berk. & Br.) Sacc. Michelia **1**: 594. 1879

On soil in Geneva Creek Canyon. The spores in this species are figured by Massee as being reticulate. I can find no reticulations although the spores are coarsely verrucose. Our specimens conform well with European specimens studied but the spores are slightly larger, reaching a maximum size of 26 μ in diameter, being much smaller, however, before reaching maturity. No other American specimens have been seen.

ASCOBOLACEAE

ASCOPHANUS CARNEUS (Pers.) Boud. Ann. Sci. Nat. V. **10**: 250. 1869

Cultivated on horse dung from Tolland.

ASCOPHANUS ARGENTEUS (Curr.) Boud. Ann. Sci. Nat. V. **10**: 245. 1869

Cultivated on cow dung from Geneva Creek Canyon.

ASCOPHANUS CINEREUS (Crouan) Boud. Ann. Sci. Nat. V. **10**: 249. 1869

Cultivated on horse dung from Tolland.

ASCOPHANUS MICROSPORUS (Berk. & Br.) Phill. Brit. Discom. 307. 1887

Cultivated on rabbit dung from Geneva Creek Canyon.

ASCOBOLUS IMMERSUS Pers. Obs. Myc. **1**: 35. 1796

Cultivated on cow dung from Geneva Creek Canyon and horse dung from Tolland.

ASCOBOLUS STERCORARIUS (Bull.) Schröter in E. & P. Nat. Pfl. **1**: 198. 1897

Cultivated on cow dung from Geneva Creek Canyon and Tolland.

Ascobolus xylophilus sp. nov.

Plants gregarious, sessile, 1–2 mm. in diameter, dark-colored, blackish to the naked eye, reddish-brown with the lens; hymenium slightly concave or nearly plane; asci large, cylindric or clavate, 175–235 × 30–35 μ, operculate, 8-spored; spores 1-seriate or partially 2-seriate above, large, ellipsoid, with ends narrowed, purple, at first smooth, becoming slightly roughened, 35–38 × 13–15 μ.

On the weathered surface of some coniferous wood, Geneva Creek Canyon, September, 1910.

Two species of *Ascobolus* are reported by Saccardo on pine wood: *Ascobolus lignatilis* Albert. & Schw. and *Ascobolus denudatus* Fries. Our species is very different from either, both in gross and spore characters. This is, so far as we can find, the only North American species of the genus reported on wood, most of the species occurring on the dung of animals.

LASIOBOLUS EQUINUS (Müll.) Karst. Act. Soc. Faun. Fl. Fenn. **2**: 122. 1885

On cow dung and horse dung from Tolland.

RYPAROBIUS CRUSTACEUS (Fuckel) Rehm, Ber. Naturh. Ver. Augsburg **26**: 17. 1881

Cultivated on rabbit dung from Geneva Creek Canyon.

RYPAROBIUS PACHYASCUS Zukal; Rehm, Hedwigia **27**: 167. 1888

Cultivated on horse dung from Tolland.

RYPAROBIUS SEXDECIMSPORUS (Crouan) Sacc. Syll. Fung. **8**: 541. 1889

Cultivated on cow dung from Geneva Creek Canyon.

SACCOBOLUS KERVERNI (Crouan) Boud. Ann. Sci. Nat. V. **10**: 229. 1869

On cow dung from Geneva Creek Canyon.

SACCOBOLUS NEGLECTUS Boud. Ann. Sci. Nat. V. **10**: 231. 1869

Cultivated on horse dung from Geneva Creek Canyon.

HELOTIACEAE

CHLOROSPLENIUM AERUGINOSUM (Oeder) De Not. Comm. Critt. Ital. **1**: 376. 1864

Only the stained wood of this species was collected by Professor Bethel, at Tolland, so that the identity of the species is uncertain.

HELOTIUM CITRINUM (Hedw.) Fries, Summa Veg. Scand. 355. 1849

Common on rotten wood, Tolland and Geneva Creek Canyon.

?HELOTIUM POPULINUM Fuckel, Symb. Myc. 316. 1869

The plants referred to this name are very minute and bright lemon-yellow, at least in fresh specimens, and occur in abundance on decaying leaves of *Populus tremuloides*. Fuckel's species is described as subfuscous and we are therefore in doubt as to the identity of our plants.

HELOTIUM SULPHURATUM (Schum.) Phill. Brit. Discom. 161. 1887

Common in Geneva Creek Canyon on dead spruce branches partially buried in the ground. Similar to *Helotium citrinum*.

DASYSCYPHA ARIDA (Phill.) Sacc. Syll. Fung. **8**: 455. 1889

Peziza arida Phill. Grevillea **5**: 117. 1877.

Lachnum Engelmanni Earle, Pl. Baker. **1**: 25. 1901.

Dasyscypha fuscosanguinea Rehm, Ascom. 112; Ber. Naturf. Ver. Augsburg **26**: 30. 1881.

This species was originally described from material collected in Blue Canyon, Sierra Nevada Mountains, California, by Harkness and Moor. The type has not been seen but a specimen in the herbarium of the New York Botanical Garden collected by Dr. Harkness in Blue Canyon, California, has been examined and our Colorado specimens conform well with this. Dr. Rehm (l. c.) states that this species is a variety of *Dasyscypha fuscosanguinea* Rehm. So far as we can see they are identical but inasmuch as Dr. Rehm's specimens were distributed without a description we cannot do otherwise than accept the name published by Phillips. Numerous specimens were collected at Tolland and in the Geneva Creek Canyon and at first referred to *Lachnum Engelmanni* Earle, which species was later found to be identical with that of Phillips.

The species appears to be common and widely distributed, specimens having been examined from California, Colorado, Montana, Oregon, Washington, and Newfoundland, occurring on dead branches of pines and spruces.

Dasyscypha chlorella nom. nov.

Lachnum viridulum Massee & Morgan; Morgan, Jour. Myc. **8**: 187. 1902. ?Not *Dasyscypha viridula* (Schrad.) Sacc. Syll. Fung. **8**: 437. 1889.

The type of *L. viridulum* has not been seen, but our specimens conform well with a colored drawing made from the type by Massee, as well as with the original description. A specimen collected at Tolland seems to conform with the one collected in Geneva Creek Canyon except that the plants have faded to nearly white.

LACHNELLA CORTICALIS (Pers.) Fries, Summa Veg. Scand. 365. 1849

Common on bark, more rarely on decorticated wood at Golden and in the Geneva Creek Canyon. The species is very variable, the spores being clavate or fusiform, often as long as 26 μ and with 1–3 delicate septa. *Lachnella canescens* Cook; Phill. Brit. Discom. 259 appears to be identical.

LACHNELLA FLAMMEA (Albert. & Schw.) Fries, Summa Veg. Scand. 365. 1849

Peziza flammea Albert. & Schw. Consp. Fung. 319. 1805.
Dasyscypha allantospora Earle, Pl. Baker. **2**: 5. 1901.
Lachnella rhoina Earle, Pl. Baker. **2**: 6. 1901.

Very common on dead twigs of various kinds at Tolland and in the Geneva Creek Canyon. The types of *Dasyscypha allantospora* and *Lachnella rhoina* have been examined and found to be rather faded specimens of the above. The spore measurements of the latter species given by Professor Earle are too small.

LACHNELLA RESINARIUS (Cooke & Phill.) Phill. Brit. Discom. 242. 1887

Specimens collected at Tolland conform fairly well with the original description of this species. The plants occur on the bark of some conifer and somewhat resemble *Lachnellula chrys-*

ophthalma, but are smaller, a little less hairy, and the spores are very different, being ellipsoid or allantoid, while in the latter species they are globose.

LACHNELLULA CHRYSOPHTHALMA (Pers.) Karst. Medd. Soc. Faun. Fl. Fenn. **11**: 138. 1884

This is one of the most common species of cup-fungi on conifers in the canyons of the mountains, both at Tolland and at Geneva Creek, and being rather large and bright-colored, is easily detected. Our plants compare very favorably with European exsiccati and although common in the Rocky Mountains, no American specimens could be found in our collections at the New York Botanical Garden.

MOLLISIACEAE

MOLLISIA CINEREA (Batsch) Karst. Myc. Fenn. **1**: 189. 1871

One collection on old wood near Tolland.

ORBILIA VINOSA (Albert. & Schw.) Karst. Myc. Fenn. **1**: 101. 1871

On old wood in Geneva Creek Canyon.

ORBILIA FLEXUOSA Grossl. Grevillea **22**: 44. 1893

On old wood in Geneva Creek Canyon.

PSEUDOPEZIZA MEDICAGINIS (Lib.) Sacc. Malpighia **1**: 455. 1886

Abundant on leaves of alfalfa at Golden.

PATELLARIACEAE

PATELLARIA ATRATA (Hedw.) Fries, Syst. Orb. Veg. 113. 1825

On old wood in Geneva Creek Canyon.

CENANGIACEAE

CENANGIUM POPULNEUM (Pers.) Rehm in Rabenh. Krypt. Fl. **1**: 220. 1896

Common on *Populus tremuloides* in Geneva Creek Canyon.

Godronia Betheli sp. nov.

Ascomata erumpent through the outer bark of the host, single or occurring in clusters, often so numerous as to form congested masses many cm. in diameter and almost entirely surrounding the branches on which they grow; individual ascomata at first nearly

globose, opening at the top so as to leave an irregular margin, at maturity about 1 mm. broad and the same in height, brownish and furfuraceous externally, hymenium freely exposed at maturity, whitish or bluish-white; asci clavate, 130 × 7–8 μ, 8-spored; spores in a fascicle in the ascus, subfiliform, tapering toward either end, sharp-pointed, 65–85 μ long and 3–4 μ thick at the broadest point, becoming 7-septate at maturity and often slightly constricted at the septa, hyaline; paraphyses abundant, filiform.

On the branches of some species of willow, Tolland, August, 1910.

STICTIDACEAE

CRYPTODISCUS ATRO-CYANEUS (Fries) Sacc. Syll. Fung. **8**: 670. 1889

Very common on old wood of *Populus tremuloides*, Geneva Creek Canyon, Golden and Tolland.

Ocellaria ocellata (Pers.)

Peziza ocellata Pers. Syn. Fung. 667. 1801.
Ocellaria aurea Tul. Fung. Carp. **3**: 129. 1865.
Dermatea inclusa Peck, Ann. Rep. N. Y. State Mus. **30**: 62. 1878.
Dermatea macrospora Clements, Bull. Torrey Club **30**: 87. 1903.

The plants are erumpent but do not rise much above the surface of the bark. Very common on willow about Tolland. Fungi Columbiani *1918*, issued as *Dermatea inclusa* Peck, is identical with our Colorado specimens and so far as we can judge from the description Dr. Peck's species is identical with the above.

PROPOLIS FAGINEA (Schrad.) Karst. Myc. Fenn. **1**: 244. 1871

Propolis versicolor Fries, Summa Veg. Scand. 372. 1849.

On old wood, Tolland.

STICTIS RADIATA (L.) Pers. Obs. Myc. **2**: 73. 1799

On old wood, Geneva Creek Canyon and Tolland.

HYPODERMATACEAE

HYPODERMA LINEARE (Peck) Peck; Thüm. Myc. Univ. 1073. 1878

Rhytisma lineare Peck, Ann. Rep. N. Y. State Mus. **25**: 100. 1873

Abundant on leaves of *Pinus* sp. in the vicinity of Tolland.

This species is characterized by its peculiar spores which appear like two spores united by a very narrow neck.

LOPHODERMIUM ARUNDINACEUM (Schrad.) Chev. Fl. Par. **1**: 435. 1826

One specimen collected at Tolland on the stems of some grass.

HYSTERIACEAE

HYSTERIUM COMPRESSUM Ellis & Ev. Jour. Myc. **8**: 69. 1902

On old wood in Geneva Creek Canyon.

HYSTEROGRAPHIUM MORI (Schw.) Rehm, Ber. Nat. Ver. Augsburg **26**: 90. 1881

Collected on old wood at Berkeley by Professor E. Bethel.

HYSTEROGRAPHIUM VULVATUM (Schw.) Rehm, Ascom. *315*.

On old wood at Golden and Tolland.

NEW YORK BOTANICAL GARDEN.

CULTURES OF SOME HETEROECIOUS RUSTS

W. P. Fraser

A region to the north of Pictou, Nova Scotia, offered such excellent conditions for the study of many of the rusts that have a *Peridermium* for their aecial stage, that recently some time has been spent in their field study and a few cultures have been undertaken. In this region there are extensive areas of young coniferous woods with abundant growth of *Ledum, Pyrola, Vaccinium, Rhododendron, Rubus, Myrica,* and *Chiogenes,* and older and more dense woods with the same species. A large area of swamp also occurs with *Chamaedaphne* and other bog plants. This region, which comprises several square miles, produced many rusts, the following, as well as a number of others, being collected: *Melampsoropsis Pyrolae, M. ledicola, M. Cassandrae, M. abietina, Pucciniastrum pustulatum, P. arcticum, P. Pyrolae, P. minimum, P. Myrtilli, Calyptospora columnaris,* and *Cronartium Comptoniae. Peridermium balsameum, Per. decolorans, Per. columnare, Per. Peckii, Per conorum-Piceae, Per. consimile, Per. elatinum,* and *Per. abietinum* were also common.

Sowings were made on the various species of *Picea* used in the culture experiments by first placing the leaves bearing telia in a moist chamber, usually over night, until the teliospores had germinated. These leaves were then suspended over the young trees so that the basidiospores would fall on the young leaves of the spruces, and the whole was then covered with a belljar, usually for two days.

The young trees of *Picea* were obtained after the teliospores had begun to germinate in the open, but they were selected some distance from any source of infection. A considerable quantity of earth was removed with the roots and they were then placed in pots. Trees of about six to fifteen inches in height were selected, and to prevent excessive transpiration a few branches were removed. The experiments were carried on in a well-lighted

laboratory of Pictou Academy, no culture room being available. It is hoped that the experiments may be repeated and extended next spring.

The writer wishes to acknowledge with deepest gratitude invaluable suggestions and assistance rendered by Dr. J. C. Arthur, without which the cultures would probably not have been undertaken. The writer's thanks are also due to Mr. John Macoun, of the Geological Survey of Canada, for determining some of the host plants.

MELAMPSOROPSIS CASSANDRAE (Peck & Clinton) Arthur

The uredinial stage of this rust was collected on *Chamaedaphne calyculata* (L.) Moench in a large swamp during the summer of 1909. The host plants were kept under observation during the next spring for the purpose of collecting the telial stage. It was found in June in several places in the swamp and always on plants growing beside *Picea*. The teliospores were first noticed germinating on June 13 and they continued to germinate for some time in moist weather. Leaves bearing mature telia were collected and sowings were made on young trees of *Picea rubra* (DuRoi) Dietr. on June 17. Pycnia appeared on June 29, followed by aecia in a short time. Four plants were used and each sowing was successful. The infection was marked, and was most abundant just below where the telia-bearing leaves had been suspended. Two trees obtained in the same place as those used in the experiment were kept as controls and they remained free from aecia. The aecia were found on examination to be *Peridermium consimile* Arth. & Kern.

The spruces in the swamp near which the telia were found were watched for the appearance of aecia. Both pycnia and aecia developed abundantly and in such a position as to leave little doubt that the infection came from the telia on *Chamaedaphne*. Collections were made on July 17 and 24. On the latter date the aecia were mature. Part of the collection of July 17 was sent to Dr. Arthur for determination. He replied that it was *Peridermium consimile* Arth. & Kern and the host *Picea rubra* (DuRoi) Dietr.

Clinton (Rep. Conn. Agric. Exper. Sta. **6**: 386. 1908) sowed

the spores of *Peridermium consimile* on *Chamaedaphne calyculata* and the uredinial stage of *Melampsoropsis Cassandrae* appeared. This seems to be the only previous attempt to establish the connection of these forms.

MELAMPSOROPSIS ABIETINA (Alb. & Schw.) Arthur

The uredinial stage of this rust was very common on *Ledum groenlandicum* Oeder in the summer of 1909, and many collections of aecia were made on the spruces near, which seemed to belong to the form on *Ledum,* but as no telia were collected the connection appeared doubtful. The next spring telia were found to be very common on the under side of small, thin leaves of *Ledum,* from which the tomentum was absent. The teliospores were germinating freely the second week of June, the first collection being on June 10. At this time the young shoots of *Picea rubra* and *P. mariana* were opening, those of *P. canadensis* having opened about a week earlier.

On June 16 sowings were made on *Picea rubra* (DuRoi) Dietr. Pycnia appeared abundantly on June 25 and abundant aecia soon followed. Four trees were used and the infection was pronounced on all of them. The aecia were found on examination to be *Peridermium abietinum* (Alb. & Schw.) Thüm. Two plants of *Picea* obtained in the same place as those used for the cultures were kept as controls and remained free from aecia.

In the field, pycnia and aecia developed on the spruces that grew near the telia-bearing *Ledum.* This was observed in many places, though sometimes *M. ledicola* was near and a possible source of infection. In one place where there was abundant germination of the telia of *M. abietina* and no other rust was in the vicinity, the aecial infection on the spruces near was very pronounced. A collection from this source was made on July 17 and part of it was sent to Dr. Arthur. He reported the collection as *Peridermium abietinum* (Alb. & Schw.) Thüm. and the host as *Picea rubra* (DuRoi) Dietr.

All the forms of this rust are very common in the vicinity of Pictou. The telial stage was often found occurring on the same plants as *M. ledicola,* but was much more common than that species.

MELAMPSOROPSIS LEDICOLA (Peck) Arthur

Peridermium decolorans Peck was found to be very common on *Picea*, especially on *Picea canadensis* (Mill.) BSP., during the summer of 1909. In the spring of the following year the *Ledum* plants that were near the trees so richly infected by *Per. decolorans* were kept under observation and telia were found germinating about the first of June. The telia were then quite conspicuous on the upper surface of the leaves.

On June 7 sowings were made on four young trees of *Picea canadensis*. Pycnia were evident on June 19 and aecia followed in a short time. All the plants developed pycnia and aecia, but the infection was sparing on two of them and pronounced on the others. The aecia were determined as *Peridermium decolorans* Peck. Two plants of *Picea canadensis* from the same place as those used in the cultures were kept as controls and remained free from aecia.

The young shoots of *Picea canadensis* were just opening as the telia of *M. ledicola* began to germinate in the field and not until a week or ten days later did the buds of *P. rubra* and *P. mariana* open. This may account for the *Peridermium* being much more common on *Picea canadensis* than on the other species.

The trees of *Picea canadensis* that grew beside the rusted *Ledum* developed pycnia and aecia very abundantly; the trees nearest showed the richest infection, the aecia gradually diminishing as the trees became more distant from the *Ledum* rust. A collection of the aecia was sent to Dr. Arthur, and was determined as *Peridermium decolorans* Peck. During the summer several collections of *P. decolorans* were made, and in every case *Ledum* plants were found near, the leaves of which showed the spots where the telia of *M. ledicola* had germinated in the spring.

The aecia on *P. canadensis* were shedding spores by July 5. A few collections of aecia were made on *P. mariana* during the summer.

MELAMPSOROPSIS PYROLAE (DC.) Arthur

Rostrup has suggested that *Peridermium conorum-Piceae* (Reess) Arth. & Kern is the aecial stage of this rust. Arthur and Kern (Bull. Torrey Club **33**: 432. 1906) state that the

geographical distribution of the form on *Pyrola* would favor this assumption. As the uredinial and telial stages were very common on *Pyrola americana* Sweet and *P. elliptica* Nutt., their development was watched during the spring and early summer of last year, and the cones of the spruces in the vicinity were also kept under observation for evidence bearing on these suggestions.

By May 7 many of the uredinia were mature and the spores were escaping. The telia were first noticed germinating on May 20, and by May 23 germination was general. At this time the young pistillate cones of *Picea canadensis* were open and in a few days those of *P. rubra* and *P. mariana* were in the same condition. By the first of June the teliospores had pretty well germinated and no germinating material could be found on June 10. The cones of the spruces in the vicinity were closely watched for the appearance of pycnia. Their first appearance, as indicated by the yellow color of the scales, was on June 21, and by July 4 they were common. Owing to my absence, the place could not be visited again until July 17, when it was found that the aeciospores of *Peridermium conorum-Piceae* were being shed very abundantly from the cones of *Picea mariana* in the vicinity of the rusted *Pyrola* plants. The cones of the young trees that were easily accessible were found to be generally infected, and many of the cones on the larger trees were also infected. The *Peridermium* is conspicuous at this time, and the aecia-bearing cones could be seen at a considerable distance. As far as was observed the *Peridermium* was confined to the vicinity of the *Pyrola* plants that bore germinating telia in the spring.

The field evidence strongly supported the view that these forms are connected, and tends to confirm the statement of Arthur and Kern (l. c.) that the *Peridermium* is common though not often collected.

CALYPTOSPORA COLUMNARIS (Alb. & Schw.) Kuehn

A collection of the aecial stage of this rust was reported from Pictou last year (Science **30**: 814. 1909). It was then found to be generally distributed but rather sparingly developed in any place. Observations were begun earlier in the spring of 1910 and well developed aecia were collected on June 21. The aecia

soon became common, and in shaded places where the form on *Vaccinium* was near, were abundant and rather conspicuous on the young host plants, *Abies balsamea* (L.) Mill. It would seem that the collections of last year were made after the period of greatest abundance was past. Collections were made at other places in the province, and the aecial stage is probably common everywhere.

PERIDERMIUM BALSAMEUM Peck

This form is very common on its host throughout this province. It was found so often associated with *Pucciniastrum arcticum* (Lagerh.) Tranz. on *Rubus idaeus* var. *aculeatissimus* (C. A. Mey.) Regel & Tiling, that it pointed strongly to their connection. *Pucciniastrum pustulatum* and *P. minimum* are also common but there was no evidence of their connection with the *Peridermium*.

UROMYCES PECKIANUS Farlow

This rust was found common on *Distichlis spicata* (L.) Greene around the border of a small inlet of the harbor. Aecia were collected in several places in May on *Atriplex patula* L. and in each case the telia of *Uromyces Peckianus* were found close beside the infected plants. The aecia were very abundant, and examination showed that the teliospores of the *Uromyces* had germinated. The evidence of connection was so strong that it was decided to try a culture. Telial material had been collected from the same place in the spring and was available for use. This material was placed in a moist chamber and gave excellent germination. Plants of *Atriplex* were obtained at the seashore, as far removed as possible from the rusted *Distichlis,* and were placed in pots. Telial material was placed in a moist chamber over night when it was found to be germinating. The teliospores were then transferred with a knife to the leaves of the *Atriplex,* and the plants were covered with a belljar for a day or two. The sowing was made on May 21. Pycnia were noticed on the plants in one of the pots on June 4, but they probably appeared earlier. Aecia developed in a short time. The infection was rather sparing, only about half a dozen spots with aecia appearing altogether. The second pot of plants showed no infec-

tion, but the plants did not flourish. A pot of *Atriplex* obtained at the same place as the others was kept as a control; it remained free from aecia.

A number of plants of *Atriplex* had also been transferred to the garden outside. A sowing was made on these by germinating the teliospores in a moist chamber, and suspending the *Distichlis* leaves bearing them so that the basidiospores would fall on the *Atriplex* plants; the whole was then covered with a belljar for about two days. This sowing was made on May 28 and on June 11 abundant pycnia were noticed, which probably appeared before that date, as the plants were not carefully watched. Aecia began to form in abundance but they were eaten out of the leaves, probably by insect larvae or slugs. The experiment was carried on outside.

The infection was so marked that it left little doubt that the forms were connected, and to establish this another experiment was tried in the laboratory. Plants of *Atriplex* were obtained as before; also a number of flourishing young plants of *Chenopodium album* L. from a waste heap. Sowings were made on these on June 12 by suspending above them *Distichlis* leaves bearing telia that had been germinated in a moist chamber. The whole was then covered as usual with a belljar for a day or two. The plants were carefully watched and pycnia became evident on June 21 and were soon followed by abundant aecia. The infection was very marked on both the *Atriplex* and *Chenopodium*, but especially so on the latter, where the aecia frequently formed rows on the leaves corresponding to the *Distichlis* that had been suspended above. No aecia developed on the plants in the field around those that had been used for the experiments, and controls of *Atriplex* remained free from infection. Some of the *Atriplex* plants used in the experiments were matured and were found to be *Atriplex patula* var. *hastata* (L.) Gray.

Collections of aecia were made on *Salicornia europea* L. and *Suedia maritima* (L.) Dumort, which, from their association with the telia on *Distichlis*, seemed to be also connected. A sowing was tried on *Salicornia*, but without result. The plants, however, did not flourish and it may have been on that account that there

was no infection. The field evidence went to show that *Salicornia,* if connected, was not readily infected.

Arthur has shown by numerous experiments that *Puccinia subnitens* Diet., also on *Distichlis spicata,* has its aecia on *Chenopodium* and *Atriplex* as well as on a number of other plants. These experiments show that *Uromyces Peckianus* has similar aecial hosts.

PICTOU ACADEMY,
PICTOU, N. S.

THE PERSONAL FACTOR IN MUSHROOM POISONING

JOHN DEARNESS

It is an old saying that what is one man's meat is another man's poison. Doubtless every reader has a few acquaintances whose dietetic idiosyncrasies are matter of remark among their friends. I happen to know two persons who are made ill by eating cake or other food containing egg,—never by eating eggs themselves, because neither could be bribed to taste them willingly. Not a few have to pay the penalty of total abstinence from some delicacy for having once indulged in a surfeit of it. Possibly the majority of us have discovered some generally wholesome article of diet which it is prudence on our part to avoid.

One of the theories offered to explain some of these vagaries of digestion is that many kinds of food, particularly those for which a taste has to be acquired, contain substances—call them poisons if you like—which our leucocytes have to learn to neutralize. Another theory is that in the chemical laboratory of the digestive system there are made a great variety of compounds; in exceptional cases or under exceptional circumstances, some of these may be poisonous enough to cause auto-intoxication. The imagination, too, sometimes exercises a remarkable influence upon the digestive organs. Workers in a logging camp are not apt to be squeamish. I knew of a case where one of a number of them who had just disposed very acceptably of a deep pie, on being informed of the kind of meat it contained, was immediately seized with violent *mal de mer*.

In Dr. Murrill's "Poisonous Mushrooms," MYCOLOGIA **2**: 255–264, the statement recurs, in effect if not in words, "harmless to some, poisonous to others." The question naturally arises why such opposite effects as nutrition and poison from so many species of one group of plants. Inquiry into the causes may be regarded as practical in view of the fact that there are easily ten

times as many people interested in mycophagy as in scientific mycology.

By way of drawing attention to the subject, rather than of throwing light upon it, I beg to cite three types of instances of alleged mushroom poisoning which I have had the opportunity to investigate:

A. A fellow-citizen dined on a quart of common mushrooms (*Agaricus campestris*) that he had purchased at a fruit stall. Within twelve hours he was ill enough to have a physician called, who pronounced his case one of toadstool poisoning. His recovery was complete in two or three days.

B. Near a neighboring town a man collected "a basketful" of supposed mushrooms. His wife was suspicious of them, with the consequence that the collector cooked and ate them without assistance. Before morning he was "sick enough to die," but the promptitude of the doctor "saved his life."

C. A week of wet, warm weather early in May had brought up in a thinly wooded pasture an abundant crop of helvellas (*Gyromitra esculenta*). Two or three families in the neighborhood collected them for food. One of the families, on a Tuesday evening, ate about two quarts of them, the method of preparation being frying in butter. On the next day at noon a smaller quantity—about a quart and a half—was similarly disposed of. That night every member of the family was taken ill, and on Friday one of them, in spite of the efforts of two physicians, passed into a comatose condition which terminated in death. The others recovered without medical treatment.

The explanation given out in case A was that there "must have been a toadstool among the mushrooms." It is not improbable that wholesome fungi have been blamed for the faults of bad company. In this instance, however, examination of specimens from the basket out of which the quart had been taken revealed a thorough infestation of larvae. Half the quantity of as wormy mutton might have produced worse effects. The limit of edibility of a fungus is reached by the time its "worminess" shows tunnels that can be detected with the unaided eye.

In case B the offender proved to be *Lepiota naucinoides*. The victim assured me that he had admitted no other kind to his

basket; indeed, that he had been "very particular to gather only fresh, clean specimens." While I suspect that this beautiful and highly commended toadstool is slightly poisonous, I believe that had the consumer under notice made its acquaintance more gradually he might have brought himself to eat "three platefuls of it" with safety. When we consider that, properly remorseful for scouting his wife's advice, he imagined that he had eaten a potful of deadly toadstools, we cannot wonder that his overloaded stomach made him feel sick enough to die.

C. Both terms of the binomial *Helvella esculenta,* suggest eating —wholesale and wholesome. Some European mycophagists have written commendations of this fungus. Berkeley's reference to its edibility is tempered with the caution that it is unsafe for some persons, a circumstance dependent rather on a peculiarity of the person's constitution, than upon some deleterious quality of the plant. The personal equation does not seem wholly sufficient to explain the history of the cases cited under C. *Helvella esculenta,* or *Gyromitra* as it is now called, cannot be mistaken for any other species, hence the variously toxic effects referred to may all be surely ascribed to the fungus named. These did not appear, it is needless to say, and were not suspected, after the first meal. Yesterday, they seemed nutritious or at least innocuous; to-day, they are poisonous to the same persons. In view of all that I could learn, it seemed more probable that the poison developed in the collected fungi than that it was started during their digestion. For a genuinely fleshy fungus, *Gyromitra* is not readily putrescible. Specimens taken from the same ground lay on my table a week or more without any sign of change save shrinkage in volume.

The heavy sickening odor given off by *Amanita phalloides* and *A. verna* in drying is well known. In the slow relaxation by moist air in a closed vessel of well-dried specimens of *Helvella crispa, Boletus Clintonianus,* and *Agaricus silvicola*—three species named in the edible lists—I have observed the development of a similar odor. The odors may not have any connection with the deadly alkaloid present in the *Amanita,* but they are evidence of some similar chemical change.

Among the unstable nitrogen compounds present in some of

the fungi, I can conceive that decompositions may take place that are not evident as putrescence, resulting in poisonous compounds. Such changes might be arrested or facilitated by the conditions in the alimentary canal and become effective inversely as the vigor and rapidity of the digestive process. If there is any truth in this speculation, then it follows that a person who may have eaten without injury any of those species characterized as "harmless to some, poisonous to others" at one time, might be poisoned by the same species at another time.

In the process of disintegration, nocuous products undoubtedly do develop from innocent compounds, but, further, it is quite conceivable that the strength of poisonous principles may vary in the same species of mushroom or that even some alkaloid may be normally present in one set of conditions and be absent in another. On what other theory can one explain the experience reported by Dr. Cleghorn in the October number of *Good Housekeeping*? *Coprinus comatus* ranks very near the common meadow mushroom in general popularity, and in the literature of mycophagy it is usually spoken of with unqualified commendation, yet here is an experience in a neighborhood where the shaggy-mane was "formerly eaten with pleasure" in which ten persons in four different families were made so ill as to require medical aid. The symptoms as reported by Dr. Cleghorn are interesting enough to repeat. In some cases these appeared in a few minutes after eating, in others after several hours. They exhibited a well-marked intoxication, with failure of muscular coordination, blood-shot, dilated eyes, incoherent speech, and drowsiness, but without depression of the action of heart and lungs.

The variability of the effects produced by eating mushrooms or toadstools raises a number of very interesting questions, the consideration of which from any point of view increases the sense of responsibility attendant upon recommending almost any of these plants as articles of diet to the uninitiated.

LONDON, ONTARIO,
CANADA.

THE AGARICACEAE OF TROPICAL NORTH AMERICA—II

WILLIAM A. MURRILL

The genera treated in the present paper show a strong contrast to most of those in the first article of this series, both as to the number of species found in our tropics and the general information regarding them. This is chiefly due to the fact that tough forms growing on wood above ground are better adapted to tropical conditions than fleshy forms, especially the larger ones, growing in the soil, where air is scarce and bacteria and moulds abound in the rainy season, and where extreme conditions of heat and dryness prevail during the dry season. The fleshy forms are also difficult to collect and preserve, and require good field notes to make them really valuable for study.

These genera are all abundantly represented in temperate regions, some of the species being the most common ones found in our forests, but tropical conditions appear to offer an almost impassable barrier to them, *Lepiota* alone excepted. The following simple key shows how these genera may be readily distinguished.

Volva and annulus both present.	1. LEUCOMYCES.
Volva alone present.	2. VAGINATA.
Annulus alone present.	
Lamellae free.	
Spores hyaline, tinged with brown in a few species.	
Pileus dry, usually scaly.	3. LEPIOTA.
Pileus viscid, smooth.	4. LIMACELLA.
Spores green when fresh, brown in herbarium specimens.	5. CHLOROPHYLLUM.
Lamellae attached.	
Stipe fleshy.	6. POLYMYCES.
Stipe cartilaginous.	7. CHAMAEMYCES.

1. LEUCOMYCES Batt. Fung. Hist. 27. 1755

Venenarius Earle, Bull. N. Y. Bot. Gard. **5**: 450. 1909.

This genus includes the species usually known under the name *Amanita,* which name is properly a synonym of *Agaricus,* as

pointed out by Earle. The separation of *A. muscaria* and related species into the genus *Venenarius* is hardly practical, since the form of the basal volva is not constant in either of the two genera thus separated.

Leucomyces mexicanus sp. nov.

Pileus convex, regular, 5 cm. broad; surface milk-white, smooth, dry, with satiny luster, adorned with patches of the membranous volva, which are 2–3 mm. broad, thin, white, separable; margin thin, entire, concolorous; context thin, white, odor distinct, pleasant; lamellae white, remote from the stem, arcuate, narrow, crowded; spores oblong, smooth, hyaline, 4–5 × 2 μ; stipe cylindric, equal, white, hollow, glabrous, 4.5 cm. long, 4 mm. thick, not swollen at the base; annulus superior, membranous, ample, white, movable; volva white, circumscissile, the basal portion small, collapsed, and scarcely noticeable.

Type collected on rich earth in a moist virgin forest near Motzorongo, Mexico, 400 meters, January 15, 1910, *W. A. Murrill 1067*.

This species resembles *Lepiota* more than it does most species of *Leucomyces*, but it has a distinct volva and the pileus shows separable volval patches. The odor is pleasant, suggesting *Trametes suaveolens*, though not so distinct.

2. VAGINATA (Nees) S. F. Gray, Nat. Arr. Brit. Pl. **1**: 601. 1821

Amanitopsis Roze, Bull. Soc. Bot. Fr. **23**: 50. 1876.

This genus differs from *Leucomyces* chiefly in lacking a veil, although both genera have the sheath, or volva, at the base of the stipe.

Vaginata vaginata (Bull.)

Agaricus vaginatus Bull. Herb. Fr. *pl. 98*. 1782.

This species, so abundant in temperate regions, probably occurs sparingly in the northern Bahamas and in the high mountains of our tropics. The Bahamian material, collected by Mr. Nash, is pressed flat and is without notes, except that the color was white and no ring was observed. Two specimens collected by myself at Chester Vale, Jamaica (No. 351), at an elevation of over 3,000 ft., agree very well with the small, murinous, temperate form of this species, but the base of the stipe and volva were, unfortu-

nately, decayed when the plants were found. However, there are large patches on the surface of the pileus which indicate that most of the volva was carried up by it in developing, leaving very little at the base. No attempt is made to cite here the synonyms of this species.

3. LIMACELLA Earle, Bull. N. Y. Bot. Gard. **5**: 447. 1909

This genus differs from *Lepiota* chiefly in having a smooth, viscid pileus instead of a dry and scaly one, as is well illustrated in one of the best known species, *L. illinita*.

Limacella agricola sp. nov.

Pileus convex, regular, rather firm for the genus, 2.5 cm. broad; surface smooth, glabrous, slimy, white, with incurved, striate margin; lamellae free, white, broad, unequal; spores subglobose, smooth, pure hyaline, often uninucleate, 4–5 μ long; stipe cylindric, even, white, glabrous, shining, slightly bulbous at the base, 2.5 cm. long, 2 mm. thick; annulus superior, slight, evanescent.

Type collected on the lawn at Constant Spring Hotel, near Kingston, Jamaica, December 20, 1909, *W. A. & Edna L. Murrill.*

4. LEPIOTA (P. Browne) S. F. Gray, Nat. Arr. Brit. Pl. **1**: 601. 1821

This genus is based on the well-known "parasol mushroom" of temperate regions, *Lepiota procera*. The species seem well adapted to tropical conditions, possibly owing to their loose texture and their choice of humus or well-drained locations. For present purposes, the various genera recognized by Earle, *Cystoderma, Fusispora, Mastocephalus,* and *Lepiota*, are all kept together. The following artificial grouping of the species here treated is given for the convenience of the student:

Pileus small, 3 cm. or less broad.
- Pileus white or whitish, the umbo usually differently colored. 1–5.
- Pileus some shade of red. 6–7.
- Pileus some shade of gray or brown. 8–11.

Pileus medium or large, 4 cm. or more broad.
- Pileus white or yellowish, the umbo often differently colored. 12–17.
- Pileus some shade of red. 18.
- Pileus brown. 19.

1. **Lepiota lactea** sp. nov.

Pileus thin, convex, slightly umbonate, solitary, 1–1.5 cm. broad; surface white, smooth, slightly silky, especially near the

margin; lamellae free, crowded, rather broad, plane, white; spores ovoid, regular, smooth, hyaline, $5 \times 3.5\,\mu$; stipe white, hollow, subglabrous, tapering upward from an enlarged base, 4 cm. long, 2–5 mm. thick; annulus large, white, persistent, near the middle of the stipe.

Type collected on the ground in a banana field at Santiago de las Vegas, Cuba, June 17, 1904, *F. S. Earle 75*. This species is related to *L. colimensis,* but is quite distinct.

2. **Lepiota colimensis** sp. nov.

Pileus convex, regular, solitary, not umbonate, 1.5 cm. broad, 5 mm. high; surface dry, white, delicately floccose, not scaly, the center concolorous; lamellae free, white; spores broadly fusiform, smooth, pure hyaline, $7–8 \times 3.5–4.5\,\mu$; stipe long, slender, white with an avellaneous tint, cepaeform at the base, 4 cm. long, 2 mm. thick above, 7 mm. thick below; annulus superior, large, white, persistent, apparently fixed.

Type collected on the ground in an orchard at Colima, Mexico, 500 m., January 3, 1910, *W. A. & Edna L. Murrill 618*. A small specimen of what appears to be the same species was collected in a moist forest at Motzorongo, Mexico, 400 m., January 15, 1910, *W. A. & Edna L. Murrill 1023*.

3. **Lepiota tepeitensis** sp. nov.

Pileus convex to expanded, slightly umbonate, 3 cm. in diameter; surface white, uneven, fuliginous at the center, adorned with fuliginous, imbricate scales, the remains of the cuticle; lamellae free, white, broad, rather crowded; spores ellipsoid, smooth, pure hyaline, usually uninucleate, $7 \times 4\,\mu$; stipe white, glabrous, tapering upward, 4 cm. long, 3 mm. thick; annulus slight, evanescent.

Type collected in humus in a moist virgin forest along the Tepeite River, near Cuernavaca, Mexico, 2300 m., December 28, 1909, *W. A. & Edna L. Murrill 522*. The general appearance of the plant suggests *Lepiota ianthina* Cooke, first found in greenhouses at Kew Gardens, but the disk and its radiations are fuliginous instead of dark-violet.

4. **Lepiota flavodisca** sp. nov.

Pileus thin, conic to subexpanded, the center remaining conic in form, solitary, 2 cm. broad; surface white, minutely crested, long and deeply striate, becoming plicate on drying, the center flavous,

subglabrous to granulose; lamellae white, free, rather crowded; spores ovoid, smooth, hyaline, uninucleate, 5–7 × 3–4 μ; stipe slender, enlarged and flavous at the base, hollow, minutely tomentose, 3 cm. long; annulus slight, evanescent.

Type collected in Bermuda grass sod at Santiago de las Vegas, August 1, 1904, *F. S. Earle 139*. A colored sketch by Mrs. Earle has proved valuable in drawing the description.

5. **Lepiota subcristata** sp. nov.

Pileus convex, umbonate, solitary, 7.5 mm. broad, 5 mm. high; surface floccose, pale-isabelline, with dark-avellaneous, imbricated scales, the umbo smooth, purplish-fuliginous; lamellae free, white; spores ellipsoid, smooth, hyaline, 5 × 3 μ; stipe slender, equal, glabrous, purplish-fuliginous, 1.5 cm. long, 1 mm. or less thick; annulus slight, evanescent.

Type collected on rotten wood near Moore Town, Jamaica, 200 m., December 16, 1908, *W. A. & Edna L. Murrill 158*. What appears to be the same species, though there are no field notes, was collected by W. E. Broadway in August and September, 1905, at The Bower, St. George's, Grenada. In one of these collections, the sporophores measure over 1 cm. in diameter, in the other, about 5 mm.

6. **Lepiota testacea** sp. nov.

Pileus conic, truncate, regular, 4 mm. broad, 2 mm. high, solitary; surface smooth, pale-testaceous, covered with fine tomentum, margin fibrillose; lamellae free, white, ventricose, broad; spores ovoid, smooth, hyaline, uninucleate, 7 × 3.5–4 μ; stipe cylindric, enlarged at the base, glabrous, white, 1 cm. long, scarcely 1 mm. thick; annulus superior, large, persistent, white, fixed by the lower margin.

Type found growing in rich soil on a damp, shaded bank near Chester Vale, Jamaica, 1,000 m., December 22, 1908, *W. A. & Edna L. Murrill 355*. Also collected on the same day in a nearby locality, *W. A. & Edna L. Murrill 401*. The relationship of this species is with *L. rubrotincta*. It is such a tiny plant that it is easily overlooked.

7. **Lepiota subgranulosa** sp. nov.

Pileus hemispheric, 1 cm. broad, 5 mm. high, solitary; surface testaceous, finely granulose, adorned with minute, conical tufts

of fibrils; lamellae free, narrow, close, white to stramineous; spores ellipsoid, smooth, hyaline, a few distinctly uninucleate, not apiculate, $7 \times 3.5\,\mu$; stipe testaceous, fibrillose, cylindric, equal, not enlarged at the base, rose-colored at the apex, 1.5 cm. long, 2 mm. thick; annulus testaceous, superior, very close to the lamellae, fixed by the lower margin, the free limb narrow and perpendicular to the stipe.

Type collected in coffee plantations at Xuchiles, near Cordoba, Mexico, 500 m., January 17, 1910, *W. A. & Edna L. Murrill 1146*.

8. **Lepiota Broadwayi** sp. nov.

Pileus expanded, regular, scarcely umbonate, about 3 cm. broad; surface dry, subglabrous, striate, avellaneous, fuliginous at the center, the cuticle remaining almost unbroken; lamellae free, white, broad, unequal; spores perfectly globose, hyaline, smooth, $5\,\mu$; stipe 3 cm. long, 3 mm. thick, enlarged above, hollow, glabrous, whitish; annulus white, ample, superior, persistent, apparently fixed.

Type collected on the ground between roots of trees in Hyde Park, St. George's, Grenada, August 27, 1905, *W. E. Broadway*.

9. **Lepiota subgrisea** sp. nov.

Pileus small, convex to expanded, slightly umbonate, gregarious, 1–1.5 cm. broad; surface avellaneous, adorned with imbricated scales arranged in a somewhat radiate manner from the glabrous, fuliginous umbo; lamellae free, white, of medium breadth and distance; spores ellipsoid, smooth, hyaline, uninucleate, apiculate, 7×3.5–$4\,\mu$; stipe white, glabrous, slightly tapering upward, 1.5 cm. long, 1–2 mm. thick; annulus slight, evanescent.

Type collected near the coast west of Port Antonio, Jamaica, December 18, 1908, *W. A. & Edna L. Murrill 246*. Also collected at Moneague, Jamaica, January 17, 1909, *W. A. & Edna L. Murrill 1135*. This species is closely related to *L. fulvaster*, from South Carolina.

10. **Lepiota aspratella** sp. nov.

Pileus expanded, often becoming depressed, somewhat umbonate, gregarious, 1–2 cm. broad; surface yellowish-brown, thickly studded with small, granular, somewhat conical warts, which are slightly browner than the rest of the surface; lamellae free, white, much crowded, rather broad, ventricose; spores ellipsoid or ovoid, smooth, hyaline, $5 \times 3.5\,\mu$; stipe curved, usually equal, concolor-

ous, floccose-scaly over its entire surface, 2–3 cm. long, 1.5–3 mm. thick; annulus not distinct.

Type collected on a much decayed log in an orange grove at Chester Vale, Jamaica, 1,000 m., December 23, 1908, *W. A. & Edna L. Murrill 379*. Also collected at Chester Vale, *W. A. & Edna L. Murrill 389*. This species is closely related to *Lepiota asprata*, described by Berkeley from South Carolina, but the surface covering is very distinct.

11. **Lepiota rimosa** sp. nov.

Pileus convex to expanded, umbonate, gregarious, 1–2 cm. broad; surface smoky-fuliginous, paler with age, faintly striate, often splitting from the margin, covered with a granular coating which cracks areolately with age exposing the white flesh; lamellae free, crowded, very broad, somewhat ventricose, white; spores subglobose or broadly ovoid, smooth, hyaline, 4 μ long; stipe cylindric, white, subglabrous, 2–4 cm. long, 1–2 mm. thick; annulus small, white, persistent, about the middle of the stipe.

Type collected on the ground in a garden at Santiago de las Vegas, Cuba, June 19, 1904, *F. S. Earle 110*. This is possibly the plant reported from Cuba by Berkeley and Curtis as *L. floralis*, a species described from South Carolina.

12. LEPIOTA CRISTATA (Bolt.) Quél. Champ. Jura Vosg. 34. 1872

Agaricus cristatus Bolt. Hist. Fung. Halifax **1**: 7. *pl.* 7. 1788.
Agaricus subantiquatus Batsch, Elench. Fung. **2**: 59. *f.* 205. 1789.

This well-known temperate species was collected in coffee plantations near Cordoba, Mexico, and in orchards at Colima, Mexico. This tropical form is smaller and much paler than the form commonly seen in the United States and Europe, and the scales on the pileus are comparatively inconspicuous, but it probably does not merit specific distinction. The margin becomes yellow when bruised.

Mexico, *W. A. & Edna L. Murrill 602, 1138*.

13. LEPIOTA LONGISTRIATA Peck, Bull. Torrey Club **25**: 368. 1898

This species, described from plants collected by Earle in gardens in Alabama, is whitish, with brown umbo, hairy-squamulose, and

marked with very long striations. The Cuban specimens mentioned below were found in gardens and on a lawn, while the Jamaica collection was made in woods.

Santiago de las Vegas, Cuba, *Earle 290, 362, 531;* Port Antonio, Jamaica, *Earle 602.*

14. **Lepiota cretacea** (Bull.)

Agaricus cretaceus Bull. Herb. Fr. *pl. 374.* 1787. (Type from France.)

Agaricus luteus With. Bot. Arr. **3**: 344. 1792. (Type from England.)

Agaricus cepaestipes Sowerby, Eng. Fungi *pl. 2.* 1797. (Type from England.)

Agaricus (*Lepiota*) *sordescens* Berk. & Curt. Jour. Linn. Soc. **10**: 283. 1868. (Type from Cuba.)

Agaricus (*Lepiota*) *cheimonoceps* Berk. & Curt. Jour. Linn. Soc. **10**: 283. 1868. (Type from Cuba.)

Lepiota cepaestipes Quél. Champ. Jura Vosg. 35. 1872.

Lepiota farinosa Peck, Ann. Rep. N. Y. State Mus. **43**: 35. 1890. (Type from Massachusetts.)

?Lepiota Magnusiana P. Henn. Hedwigia **31**: 318. 1892. (Type from Germany.)

Lepiota mammaeformis Underw. Bull. Torrey Club **24**: 82. 1897. (Type from Alabama.)

This edible, cosmopolitan species occurs in attractive and conspicuous groups or clusters, the pileus being white, or rarely yellow, and the base of the stipe usually swollen like a young onion. The mealy or warty covering over the entire sporophore strongly suggests *Amanita solitaria* and *A. echinata.* The spores are ovoid or ellipsoid, often pointed at one end, smooth, hyaline, usually uninucleate, 8–11 × 5–7 μ. *Hiatula squamulosa* Mont., described from Guiana, resembles this species, but the spores are described as ovoid-reniform. *Agaricus apodactylus* Berk. & Curt., from Cuba, is not distinct, but this is probably only a manuscript name.

Cuba, *Earle 15, 16, 547, 559, 28, 113, 52, 550, 301;* Grenada, *Broadway;* Guadeloupe, *Duss;* Santo Domingo; Nicaragua, *Oersted.* Also in the United States, South America, Europe, and the Orient.

15. LEPIOTA SUBCLYPEOLARIA (Berk. & Curt.) Sacc. Sylloge Fung. **5**: 67. 1887

Agaricus (*Lepiota*) *subclypeolarius* Berk. & Curt. Jour. Linn. Soc. **10**: 283. 1868. (Type from Cuba.)

The rather poorly preserved types of this species, as well as other specimens at Kew from tropical America, resemble *L. cretacea*, but the spores are very different, being broadly ellipsoid, smooth, hyaline, averaging $6 \times 4.3\,\mu$, and not showing a large nucleus as in that species.

16. LEPIOTA HEMISCLERUS (Berk. & Curt.) Sacc. Sylloge Fung. **5**: 66. 1887

Agaricus (*Lepiota*) *hemisclerus* Berk. & Curt. Jour. Linn. Soc. **10**: 283. 1868. (Type from Cuba.)

The types at Kew, collected by Wright, are well preserved, showing the small, rigid, conical warts on the pileus very distinctly. The spores are said to be narrowly oblong, smooth, hyaline, $11\,\mu$ long. These latter, with the warts on the pileus, strongly suggest *L. cretacea*.

17. **Lepiota jamaicensis** sp. nov.

Pileus 10 cm. in diameter, convex to plane, with a prominent hemispherical umbo, cespitose on dead wood, the entire sporophore becoming reddish-brown when bruised or on drying; surface dry, white or very pale yellowish, adorned with brownish, floccose scales 1 mm. broad, the remains of the cuticle; umbo brown, minutely scaly; context thin, white; lamellae free, white, becoming discolored when the spores mature; spores ovoid, rounded at both ends, not apiculate, often uninucleate, very pale brown, 9×6–$7\,\mu$; stipe enlarged at the base, tapering upward, 10 cm. or more long, 1.7 cm. thick below, 0.7 cm. thick above, subglabrous, slightly reddish-brown; annulus large, superior, movable, reddish-brown.

Type collected on a hardwood stump in a cocoanut plantation near Manchioneal, Jamaica, at an elevation of about 100 m., December 17, 1908, *W. A. Murrill 181*.

This plant closely resembles *Lepiota americana* Peck, a well-known temperate species, both in shape and color, but grows in dense clusters on dead wood, has decidedly browner spores, and much smaller scales on the pileus, as well as a minutely scaly

umbo. Its affinities are evidently with *Lepiota,* although the spores are not altogether hyaline.

18. LEPIOTA RUBROTINCTA Peck, Ann. Rep. N. Y. State Mus. **44**: 67. 1892

Agaricus rubrotinctus Peck, Ann. Rep. N. Y. State Mus. **35**: 155. 1884. (Type from New York.)

Mastocephalus carneo-annulatus Clements, Bot. Survey Neb. **4**: 17. 1896. (Type from Nebraska.)

This very beautiful species occurs occasionally at several points in our tropics, from sea-level up to 2,000 ft., and more frequently in the United States, at various elevations, the spores as well as the sporophore showing considerable variation. It also very probably ranges southward into South America under forms represented by *L. carminea* Pat. and *L. erythrella* Speg. *L. purpureoconia* Atkinson seems hardly sufficiently distinct. I am indebted to Dr. Peck for the determination of specimens from Louisiana.

Bahamas, *Brace 4815;* Cuba, *Britton & Wilson 398, 400;* Jamaica, *Earle 505, Murrill & Harris 867;* Honduras, *M. E. Peck.* Also in the United States.

19. **Lepiota abruptibulba** sp. nov.

Pileus fleshy, rather thin, 6–7 cm. broad, hemispheric to subexpanded, at first umbonate, at length obtuse; surface rich reddish-brown, the cuticle breaking into minute, floccose-granular scales, not striate, darker on the umbo; lamellae white, free, crowded, unequal, rather broad; spores subglobose to ovoid, smooth, hyaline, tinged with brown, 5–5.5 × 4 μ; stipe cylindric, subglabrous, tinged with reddish-brown, hollow, 7 cm. long, 6 mm. thick, the base swollen into an abrupt, flattened bulb; annulus large, persistent, superior, movable.

Type collected on the ground in a banana field near Santiago de las Vegas, Cuba, June 18, 1904, *F. S. Earle 94.* Also collected in the same locality in June and September, *F. S. Earle 67, 167;* and in thickets near Candelaria, Cuba, *F. S. Earle 209.* The description is mainly drawn from Professor Earle's excellent field notes.

5. CHLOROPHYLLUM Mass. Kew Bull. 135. 1898

This genus was separated from *Lepiota* on the basis of the green color of its fresh spores, with *C. esculentum* as its type and *C. Morgani* and *C. Molybdites* as additional species. We now know that these three names all refer to the same plant, which ranges from Brazil northward through the United States. The European species, *Schulzeria Eyrei* Mass., also has green spores, but no annulus.

The green color in the spores of *Chlorophyllum* seems to disappear rather quickly on drying, leaving the spores pale-brown, so that herbarium specimens are usually referable to the genus *Agaricus*, although otherwise resembling *Lepiota*. In describing *Agaricus guadelupensis*, Patouillard remarks that it is exactly intermediate between *Agaricus* and *Lepiota*, the spores being too pale for the former genus and too dark for the latter.

A dozen or more of the Boletaceae, among them several of our commonest species, have spores that are greenish or olivaceous when fresh, fading to brownish on drying, but in none is the green color so pronounced as in *Chlorophyllum*.

CHLOROPHYLLUM MOLYBDITES Mass. Kew Bull. 136. 1898

Agaricus Molybdites Mey. Fl. Esseq. 300. 1818. (Type from Guiana.)

Pholiota Glaziovii Berk.; Warming, Symb. Fl. Bras. 32. 1878. (Type from Brazil.)

Agaricus Morgani Peck, Bot. Gaz. **4**: 137. 1879. (Type from Ohio.)

Lepiota ochrospora Cooke & Mass. Grevillea **21**: 73. 1893. (Type from Guiana.)

Chlorophyllum esculentum Mass. Kew Bull. 136. 1898. (Type from Guiana.)

?Agaricus guadelupensis Pat. Bull. Soc. Myc. Fr. **15**: 197. 1899. (Type from Guadeloupe.)

This very large and attractive species, found in pastures and cultivated grounds, is of unusual interest on account of its green spores. It is used for food in many places, but is poisonous to some persons, though never fatal. It was first described from Guiana by Meyer, and was known to Fries through Lund's col-

lections in Brazil. Berkeley assigned the name *Pholiota Glaziovii* to specimens collected near Rio Janeiro, Brazil. Specimens collected by Jenman in British Guiana were named *Lepiota ochrospora,* owing to the fact that the spores in dried specimens appeared ochraceous by transmitted light. Other specimens collected at the same time by Jenman in pastures near the coast received the name of *Chlorophyllum esculentum,* because the gills were observed to turn green at maturity and the plant was known to be edible. Even in poorly preserved specimens, it is readily recognized by its peculiar spores, which are ovoid, smooth, pale-brown in herbarium material, apiculate, 7–9 × 5–6 μ, at times slightly larger, especially in fresh specimens.

Cat Island, Bahamas, *Britton & Millspaugh 5862;* Jamaica, *Earle 439, Underwood 3482;* Grenada, *Broadway;* Trinidad; British Guiana; Brazil. Also in New Jersey, North Carolina, Alabama, Louisiana, Mississippi, Texas, Ohio, Indiana, Kansas, Colorado, Nebraska, Michigan, Wisconsin, and Iowa.

6. POLYMYCES Batt. Fung. Hist. 34. 1755

Armillariella Karst. Acta. Soc. Faun. Fl. Fenn. **2**: 4. 1881.

POLYMYCES CINEREUS Batt. Fung. Hist. 34. 1755

Agaricus melleus Vahl, Fl. Dan. 9. *pl. 1013.* 1792.

Agaricus polymyces Schw. Schr. Nat. Ges. Leipzig **1**: 80. 1822.

Agaricus (Armillaria) mellcorubens Berk. & Curt. Jour. Linn. Soc. **10**: 283. 1868. (Type from Cuba.)

Armillaria mellea Quél. Champ. Jura Vosg. 38. 1872.

This is a very important tree parasite in temperate regions, and is also much used for food. In the tropics, it is evidently not thoroughly at home, having been found by our collectors only at Mooretown, Jamaica, and at Jalapa, Mexico. For a description and a colored illustration of this species, see MYCOLOGIA **1**: 2.

Cuba, *Wright 45;* Jamaica, *Earle 560, W. A. & Edna L. Murrill 168;* Mexico, *W. A. & Edna L. Murrill 21, 25, 136.*

DOUBTFUL SPECIES

Armillaria umbilicata Pat. Bull. Soc. Myc. Fr. **15**: 191. 1899. Described from plants collected by Duss in Guadeloupe.

7. CHAMAEMYCES Batt. Fung. Hist. 32. 1755

Mucidula Pat. Hymén. Eur. 95. 1887.

This genus, founded on the species commonly known as *Armillaria fracida* Fries, differs from *Polymyces* chiefly in its subcartilaginous stem, the adnate gills being hardly distinctive in this instance.

Chamaemyces alphitophyllus (Berk. & Curt.)

Agaricus (*Amanita*) *cubensis* Berk. & Curt. Jour. Linn. Soc. **10**: 282. 1868. (Type from Cuba.)

Agaricus (*Armillaria*) *cheimonophyllus* Berk. & Curt. Jour. Linn. Soc. **10**: 284. 1868. (Type from Cuba.)

A. (*Mycena*) *alphitophyllus* Berk. & Curt. Proc. Am. Acad. **4**: 112. 1860. (Type from the Bonin Islands.)

A. (*Mycena*) *leucoconis* Berk. & Curt. Proc. Am. Acad. **4**: 113. 1860. (Type from the Bonin Islands.)

This interesting species, easily identified by its immense globose spores, 16 μ or more in diameter, is common on exposed hardwood logs and decayed spots in standing trunks throughout the lowlands of Cuba, Jamaica, and Guadeloupe, and also occurs in Louisiana, Mexico, and elsewhere in our tropics. The only collection made above 2,000 ft. seems to have been at Jalapa, Mexico, at an elevation of 5,000 ft. Earle found it common on willow in one of the parks at New Orleans in August, 1908. It was first described from the Bonin Islands, and, according to Patouillard, it also occurs in Tonkin.

Cuba, *Wright, Earle 38, 112, 151, 267, 376, 294, 268, 150, 278, Baker 262, Underwood & Earle 420, 1137, 1112;* Honduras, *M. E. Peck;* Mexico, *W. A. & Edna L. Murrill 166, 1071;* Jamaica, *Earle 263, 562, 573, Underwood 3339, W. A. & Edna L. Murrill 120, 124, 828, Murrill & Harris 1067, 1075, E. G. Britton 996;* Guadeloupe, *Duss;* Grenada, *Broadway;* Montserrat, *Shafer 875;* Louisiana, *Earle 12;* Bonin Islands, *Wright.*

NEW YORK BOTANICAL GARDEN.

NEWS AND NOTES

Professor A. H. Graves, of the Yale Forestry School, visited the Garden on February 14 to consult the collections with reference to the diseases of certain forest trees.

Dr. J. J. Davis, of Racine, Wis., an authority on parasitic fungi, has been appointed curator of the herbarium of the University of Wisconsin. The botanical collections will be provided with ample quarters in the new biological building.

Although several articles have appeared in MYCOLOGIA containing Latin diagnoses, contributors are requested to use English for this purpose, because it makes better reading, saves time and trouble both to the author and publisher, and is fully as valid for the publication of new species.

"*Shade-Trees in Towns and Cities*," by William Solotaroff, just published by Wiley & Sons, New York, gives directions for the treatment of the principal fungous diseases of shade-trees. The work also contains many other things of interest to the tree lover, presented in attractive form and abundantly illustrated.

In "*Notes on Chilean Fungi—I*" (Bot. Gaz. **50**: 430–443. 1910), Dr. Roland Thaxter describes and illustrates the following new species of fungi: *Taphrina entomospora*, *Uncinula Nothofagi*, and *Uncinula magellanica*, all of which occur on living leaves of *Nothofagus antarctica*.

In Sweden, where the eating of mushrooms is very general, species having the "death-cup," or volva, are held in great respect, only two of these, *Amanita rubescens* and *Amanitopsis vaginata*, being considered safe by the ordinary collector.

Professor Bruce Fink has recently made a very important contribution to lichenology in the form of a large illustrated bulletin

from the United States National Museum on the lichens of Minnesota, which presents the results of many years of study in this interesting but difficult field.

In the *Botanical Gazette* for January, Professor G. F. Atkinson discusses the origin and taxonomic value of the "veil" in *Dictyophora* and *Ithyphallus,* concluding that the two genera should remain distinct and that *Phallus Ravenelii* Berk. & Curt. should remain in *Ithyphallus,* where it was placed by Fischer.

Several inquiries have been made regarding the colored charts of edible and poisonous mushrooms mentioned in MYCOLOGIA for November. The French charts, by Mazimann & Plassard, are out of print; the Swedish charts, four in number, accompany Lindblad's *Svampbok,* price 6 kr., which may be obtained through Mr. Lars Romell, Brahegatan 51, Stockholm, Sweden.

"Minnesota Mushrooms," by Professor F. E. Clements, recently published by the Geological and Natural History Survey of Minnesota, is a handy and attractive volume of 170 pages, 124 figures, and 2 plates, designed for use in the high schools and colleges of the state and distributed to them practically free of charge. The author has not attempted to incorporate into this work the advances made in classification during the last twenty years, so pupils may readily refer from it to the works of Saccardo, Peck, and others from which it is mainly compiled.

The first number of *"Phytopathology,"* the official organ of the American Phytopathological Society, appeared in February, 1911, and future numbers will appear regularly in alternate months. As its name implies, this periodical is devoted primarily to the publication of articles dealing with plant diseases, a subject of immense importance and one which is receiving much attention throughout the country. This number contains 38 pages and 5 plates, the first being a portrait of Anton De Bary, a distinguished German phytopathologist of the latter half of the past century, whose career forms the subject of the opening article. Succeeding articles deal with clover rusts, crown gall, fig diseases, floret sterility in wheat, blackleg of cabbage, fruit-spot of apple, and a book review. Professor Jones and his associates are to be con-

gratulated upon the attractive appearance and interesting contents of this number.

The difficulty of mounting agarics for the herbarium in such a way as to prevent them from being crushed, while economizing space and maintaining a single series, is recognized by every mycological curator. In many herbaria, it is still the practise to press all specimens flat and glue them to the sheet or enclose them in packets; in others, a separate box collection is kept for the larger specimens, and, when a specimen is wanted, there is much confusion and noise before it is found and finally returned to its proper place in the sequence. At the New York Botanical Garden, several devices have been tried with more or less success, the chief objects being to preserve the specimens and to arrange them, with all notes and drawings, in one series.

For large specimens, boxes of different sizes are used, and these are placed in light trays made of tulip wood, or glued to cardboard cut to fit the pigeonholes of the herbarium cases. Small specimens are placed in pill-boxes or similar thin boxes specially designed, which are enclosed in packets, a safer and better way than fastening them directly to the sheet. A very convenient arrangement for special or odd sizes is a small open box with cardboard bottom and sides of cypress or white pine or cork strips attached with glue, which box is enclosed in a packet. This device is excellent for microscopic slides, which also properly belong in the herbarium series with the specimens.

The older mycologists mounted their specimens so that they might readily be seen as the sheets were turned, a method with obvious advantages, but, unfortunately, very destructive to the specimens. A rather expensive substitute for this method is the use of envelopes with transparent fronts and boxes with glass or celluloid tops, which might at least be employed for sample sets of species to be used for ready reference in the identification of new material.

All specimens, however mounted, should be inspected at least once a year, and a small quantity of naphthalene flake added to the boxes or packets in which they are kept in order to prevent invasion by insects. Suggestions from other curators will be welcomed.

Miss A. C. Atwood, Cataloguer, Bureau of Plant Industry, Washington, D. C., contributes the following:

"In the course of my work I have chanced upon several rather important errors in Lindau & Sydow's *Thesaurus Litteraturae Mycologicae et Lichenologicae* to which the attention of users of this work ought to be called.

In vol. 1, p. 377, are several references credited to Alb. H. Dietrich: the first, no. 80, should be credited to Dietrich, Albert, (1795–1856) and the others no. 81–83, to Dietrich, Heinrich August.

In vol. 2, p. 42, a large number of references are credited to Elie Marchal: nos. 11–24, 32, should be credited to Marchal, Elie; nos. 31, 33–56 to Marchal, Emile. No. 38 is a wrong reference, no such article appearing in vol. 20 of Rev. Mycol., it is probably the same as no. 25a.

Under Cornu, Maxime, vol. 1, p. 311, no. 77 is a reference to *Comptes Rendus* XC, 1880, p. 357, which would seem to indicate that the article appeared in this volume of the *Comptes Rendus;* the fact is, however, that p. 357 contains only a note of the reading of the article, which never appeared in the *Comptes Rendus.*

I have spent some time in trying to locate this article and think it may, perhaps, be worth while to record here the information which I have gathered in regard to it. It appeared in a work published under the auspices of the Paris Academy under the title *Observations sur le phylloxera.* Paris, 1881. Cornu's part in this work was entitled *Études sur les peronosporées* and the article *Le meunier, maladie des laitues* &c. forms part I of this. In a note, Cornu states that brief resumés of this memoir were published in the *Comptes Rendus* v. 87, p. 801–803 and p. 916–919, from which we may infer that these two articles *Maladies des laitues nommée le meunier* (Lindau, v. 1, p. 311, no. 60) and *Maladies des plantes déterminées par le Peronospora* (Lindau v. 1, p. 311, no. 61) formed the basis for his later article. *Études sur les peronosporées II. Le peronospora des vignes* was published in 1882 by the Paris Academy, Cornu's title being used as a subtitle under the general title *Observations sur le phylloxera,* which latter is quoted by Lindau (see p. 321, no. 88). I cannot discover that these articles of Cornu appeared in any other form."